THE BRITISH JOURNAL

OF

OPHTHALMOLOGY

JUNE, 1929

COMMUNICATIONS

ON THE CEMENT SUBSTANCE OF THE INTRA-OCULAR MUSCLES AND CHRONIC GLAUCOMA

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PART I

THE work here described, begun primarily as a research into the nature of the cement of the plain muscle of the eye, is of interest to ophthalmologists mainly in two of its results: (1) It leads up to and includes the demonstration of a complete glaucoma mechanism; and (2), it throws a good deal of light on the filtration angle and on the ciliary body, that is long overdue.

The Cement Substance and its Function

The evidence suggests that the cement of the muscles in the human eye differs somewhat in quality from that of smooth muscle elsewhere in the body, and from that of the eyes of animals below primates. It raises the question whether this particular cement should not be included among the recognised hyaline or glass membrane structures of the eye, with a definite rôle beyond that of a mere cement. In the ciliary body particularly it appears to be needed as part of the hyaline membrane system subserving man's highly developed accommodation.

The question seems to be merely one of degree of differentiation. It is a fact that the recognised hyaline membranes of the eye can be shown to vary considerably in grade of development.

The available evidence regarding the cement falls under three headings: (1) staining properties and appearance under the microscope; (2) direct continuity (*a*) of the cement with undoubted hyaline membrane, and (*b*) of the muscle fibres with the cells that secrete the hyaline membrane concerned; and (3) facts bearing on function.

The difference from the cement of unstriped muscle elsewhere may not be great. But the less this difference, the more must this evidence incline one to look for the properties of hyaline membrane—watch-spring type of elasticity, coupled with exceptional resistance—in the cement of unstriped muscle generally.

(I) Selective Staining and Texture

Hyaline membrane colours selectively with acid orcein, less deeply than elastic tissue, but considerably more so than white fibrous tissue (collagen) does. The cement of ordinary smooth muscle colours fairly well, but that of the ciliary muscle and of the pupillary sphincter has stained so strongly in some of my sections as to suggest glass membrane properties, when considered with the evidence given below under heading (II). But I believe that in all methods involving over-staining and subsequent differentiation, the personal equation is held to influence results so greatly that such observations have little absolute value.

Sections have been stained for one or two days in a freshly-made saturated solution of orcein, of a proved brand, in acid alcohol (hydrochloric acid 1, methylated spirit 100). Differentiation has been in spirit, both with and without the acid. The procedure has varied in detail. Following Unna's practice, the staining has sometimes been intensified by heating the dish in the incubator, or slowly over a spirit lamp. Considerably over one hundred eyes have been cut and stained by this and other methods.

FIG. 1.

Cement substance of portions of circular muscle bundles under oil immersion lens.

a = elastic fibres.
b = inter-fascicular fibrous tissue.

The differential colouring being relative only, much depends on the surroundings. The various orcein-staining tissues must lie fairly open, or must be separated by non-staining material, such as epithelial cells or muscle fibres, in order to give successful results.

In some of my most successfully stained sections there happen to be conjunctival blood vessels large enough to possess a definite tunica media. The cement of the muscle of these vessels is distinctly less coloured than that of the ciliary muscle in the same sections; but this difference may be an accident of position. It must be admitted that the staining of the thin films of cement is too uncertain to carry much weight. But it is in keeping with other evidence, and this is all that one can expect.

Apart from the staining the appearance of the cement of the circular bundles of the ciliary muscle is rather striking in some old people, forming honeycomb meshworks (see Fig. 1). Many of the spaces in the meshwork may appear by this staining empty, owing to vacuolation of the contained muscle fibres. The sharply defined dusky framework of homogeneous translucent material appears to stand out with a certain rigidity of its own, rather suggestive of a hyaline membranous structure.

Variation in quality among the several hyaline membranes of the eye is very noticeable when one compares Descemet's membrane with the outer limiting membrane of the ciliary body—the cuticular lamella—the basement membrane of the pigment epithelium. In some old people the limiting membrane may be thicker in parts than the central portions of Descemet's membrane, but it does not colour nearly as deeply. And that the relatively poor staining quality of the limiting membrane indicates a lower grade of differentiation is shown also by the fact that in texture it does not present the dense glassy appearance of Descemet's membrane, or of the lens capsule. It looks relatively dull and cloudy, without very sharply defined margins; and in some of my older sections it appears far from uniform in structure owing to uneven fading—quite different from the other membranes. And it does not resist inflammatory processes nearly so well as these membranes do.

Correspondingly defective quality is found also in the laminated chronic inflammatory formations in the anterior chamber, that are formed from migrated ciliary epithelial cells, contrasting with the very dense extensions of Descemet's membrane sometimes found on the iris, or on chronic inflammatory new tissue lying against the lower part of the cornea[1]. But the cells from which the laminated accumulations in the anterior chamber are derived are probably mainly from the non-pigmented epithelium, and so belong to the inner—not the outer—limiting membrane.

(II) Direct Continuity

Continuity of the cement with recognised hyaline membrane, and of the muscle fibres with the cells that secrete the membrane, undoubtedly constitutes the strongest reason for regarding the cement as something out of the ordinary. The continuity occurs at two points—(1) at the base of the iris, and (2) at the origin of some of the ciliary muscle bundles.

(1) *At the base of the iris.* The finding of the section shown in Fig. 2 practically started the whole research. Its altogether exceptional value depends on a combination of three unusual features. There is (*a*) slight chronic inflammatory thickening of the cement of the periphery of the dilatator muscle of the pupil, (*b*) an offshoot of proliferated epithelial-muscle cells (*x*) conven-

FIG. 2. × 200.

x = Offshoot from dilatator. *y* = Limitans externa.
*x*¹ = Connecting stalk. *z* = Cement meshwork of dilatator.

iently clear of pigment, and (*c*) exceptionally deep selective orcein staining.

The section happens to cut across the thickened periphery of the muscle between two of the well known radiations that pass back into the ciliary body. Thus the fibres are in cross section, and the dark cement forms a network that is only partly obscured by the pigment in the contained fibres. The hyaline outer limiting membrane (*y*) is clearly seen to end in this network. Minute examination under the microscope revealed no difference between the substance of the muscle-cement and of the limiting membrane. The thickened cement in parts of the proliferated group of cells (*x*) is

well shown, and under the microscope streaks of the same material were very noticeable also in the narrow connecting stalk (x^1).

There is, of course, no doubt about the direct continuity of the "epithelial muscle cells" of the dilatator with the pigment epithelium of the ciliary body, that secretes the limiting membrane. They represent the same layer of the optic vesicle. And except quite at the base of the iris, and to some extent beneath the sphincter muscle, the pigmented nucleated portions of the epithelial muscle cells of the dilatator muscle retain the appearance of the

FIG. 3. × 200.

a = Proliferated epithelial cells enclosed in thin hyaline capsules.
b = Cement of dilatator pupillae.
c = Outer limiting membrane.
d = Abnormal gap, ? artefact or ? pathological.

ciliary pigment epithelium unaltered. In both positions the cement between adjacent cells is too thin to be stained. Practically the only difference is that in the iris, in place of the thick hyaline basement membrane of the ciliary body, the corresponding layer known as the "posterior border lamella" is mainly made up of unpigmented myofibril-containing expansions from the cells. It is by no means difficult, by orcein staining, to show the hyaline membrane still remaining between these contractile cell-expansions (see Fig. 3, *b*).

In other words, the forward prolongation of the outer layer of the optic vesicle, in taking on the additional function of muscular contractility does not entirely give up its primary function of forming hyaline membrane. It is what one would expect.

Fig. 3, from a highly myopic eye, shows the same thing in simpler and less striking fashion. There has been chronic inflam-

matory proliferation of the pigment epithelium of practically the whole of the corona, the elevated portion of the ciliary body; and this has extended apparently to the periphery of the dilatator muscle of the iris. Proliferated epithelial cells (*a*) have moved a little away into the neighbouring tissues, carrying with them capsules of their hyaline basement membrane. The same process of separation of cells has reduced the ordinarily thickened end of the dilatator muscle to a single layer, enclosed in a single layer of hyaline membrane, representing the external limiting membrane (*c*), but separated from the latter by a small gap (*d*), which is either an artefact or pathological.

The evidence of these photographs seems conclusive as regards the *practical identity in substance of the dilatator cement and of the external limiting membrane*. The observation must be of considerable physiological interest, since it definitely raises the question of comparison with the cement of plain muscle elsewhere in the body. It stands out as a basal fact, strong enough to serve as a basis for deduction and speculation.

(2) The essentials, in this connection, of **the origin of the ciliary muscle** may be summarised thus: Direct continuity between hyaline membrane and muscle cement can be shown, though with difficulty, and not for the whole muscle. This fact, added to the information already gained with regard to the iris muscle and its cement, is sufficient to establish a *close relationship* in structure between the hyaline membrane of the pectinate ligament and the cement. But it does not go beyond this, to establish identity.

There is no aid obtainable here from chronic inflammatory thickening of cement, such as that shown at the base of the iris. And though the junction of hyaline membrane and cement necessarily implies continuity between the muscle fibres and the endothelial cells that secrete the hyaline membrane, this continuity cannot be seen, owing to the endothelium being too thin to be traced.

Also the relationship between the original endothelial cell and the fibrillated spindle cell of the ciliary muscle is less obvious than that existing between the ciliary pigment epithelium and its end result in the non-pigmented spindle cell of the iris, found in the pupillary sphincter muscle and in the bands connecting it with the dilatator, and in the peripheral radiations of the dilatator. In the iris the relationship is punctuated by the two intermediate phases—first, that in the greater portion of the iris, in which only a portion of the cell is fibrillated and elongated, and, secondly, that in the proximal portions of the peripheral radiations of the dilatator muscle, in which the whole spindle remains pigmented, though fibrillated.

This relative weakness of the histological evidence regarding the nature and connections of the ciliary muscle cement is made good

to some extent later under section No. III, Function. The histological evidence in detail, and its limitations, are as follows:

Fig. 4 shows clearly the tapering head (*a*) of a meridional muscle fasciculus encased in hyaline membrane. There is no possibility of error in this. The darker streak on each side of the tapering

FIG. 4. × 103.

Orcein staining.

a = Tapering muscle head enclosed in hyaline membrane.
b = Posterior end of Schlemm's canal.
c = Pectinate ligament.
d = Spaces bordered by hyaline membrane.

muscle head is obviously composed of the same material as the broader hyaline bands continued back from the pectinate ligament. This being so, it is certain that the unseen cement of the muscle head must come into direct contact with the hyaline sheath, since every muscle fibre is always enclosed in cement. This is particularly noticeable in the sphincter of the pupil, ordinarily seen in cross-section.

In Fig. 5 a radial muscle head and its very thick sheath are well seen under an oil immersion lens. One of the difficulties in this work is here illustrated. The thin lines of cement between the

muscle fibres are seen, but the demonstration of their actual junction with the sheath fails, mainly, I think, owing to elastic tissue within the sheath. There is an unusual quantity of elastic tissue in this eye between the muscle heads also, seen as black, irregular blobs.

There is not the slightest doubt that these photographs illustrate a normal and typical mode of origin from the pectinate ligament. I believe that they represent the true origin in early life of all the radial (oblique), and frequently also of the inner meridional muscle

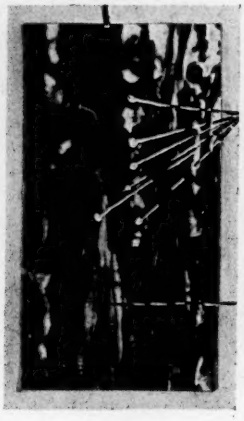
Very thick hyaline band dividing below to enclose a muscle head.
Elastic tissue.
The middle one of three streaks of cement between muscle fibres.

FIG. 5.

Under oil immersion.

fasciculi—in some cases all except the outer few fasciculi that arise from the sclerotic. Yet in most eyes it is difficult to find any such tapering sheathed muscle head, and it is quite rare to find more than one in a section.

The muscle fasciculi to the inner side of the one showing the sheathed head have all retracted more or less from their sheaths (See later, in Part II of this Paper.) And the empty sheaths do not remain open. They lie mixed with wavy elastic fibres, forming the zone of tissue bounding the angle of the chamber. And it is impossible to stain the empty hyaline sheaths selectively, except when they are pulled open by some abnormal lateral traction, such as that seen in Fig. 6, due to a shrinking lens and organizing exudate, following a recent penetrating wound.

The meridional muscle heads are also too closely packed normally for clear differential staining of their hyaline sheaths. I have sections, however, of an eye in which two fasciculi have been widened and separated by inward traction like that of Fig. 6, so that the sheaths can be clearly seen enclosing the muscle heads, and faintly, here and there, the inter-muscular cement reaching up to the sheaths, in spite of poor staining. But there are certainly exceptions to this mode of origin of the meridional muscle. See, for example, the tendon, quite free from hyaline substance, shown in the photograph, *Brit. Jl. of Ophthal.*, 1923, p. 470, and *Trans. Ophthal. Soc. U.K.*, XLV (1925), i, p. 341. And in some eyes, more especially, perhaps, those in which the lamellae of the pectinate ligament are thin, the lamellae

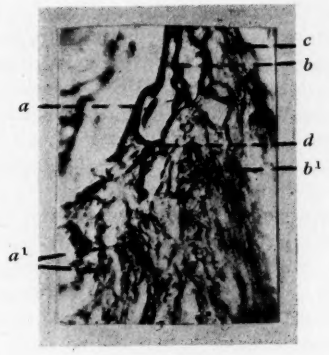

FIG. 6.

a = Hyaline band dividing below to form a sheath, containing only streaky elastic tissue.
*a*¹ = Muscle head retracted from the sheath.
b and *b*¹ = Similar band, sheath and muscle head.
c = An unretracted muscle fasciculus.

continue on to the meridional muscle fasciculi unchanged, with white fibrous centres, and hyaline coverings.

Part of the difficulty experienced in tracing the change from the Descemet endothelium to ciliary muscle fibres is doubtless due to the rearrangement of the tissues, whereby the muscle fibres lie within the glass membrane sheaths, while in the pectinate ligament the endothelium lies outside the glass membrane bands. But there need be little hesitation in affirming a direct relationship between the cells and the fibres, since there are no other cells from which any but the outer meridional muscle fasciculi can have developed. The white fibrous centres of the ligamentous trabeculae are entirely without nuclei (Salzmann[2]). Collagenous centres of quite the innermost bands of the ligament may extend backwards well beyond the level of some of the radial muscle heads. But such bands have no direct connection with the ciliary muscle; they go to the " elastic ring " (see later, Part III) and are connected through it with the dilatator muscle of the pupil.

The Scleral Origin of the Muscle. Since the whole ciliary muscle is held to form a continuous meshwork, the origin of one portion of it from hyaline membrane should serve in some degree as a hyaline connection for the whole. But this conception becomes at least somewhat strained for the outer meridional bands that commonly arise from the sclera behind the scleral furrow.

This limited purely fibrous tissue origin undoubtedly tends to discount somewhat heavily any inference that may be drawn from the much wider hyaline connections of the muscle. But it seems to be the only serious objection to the suggestion of

hyaline qualities in the muscle cement; and it is largely overcome by the fact that the direct scleral attachment is morphologically a late development, and therefore perhaps secondary in influence, a scleral spur being confined to primates.

Morphology

A cursory examination of the eyes of the more readily available domesticated mammals serves further to reduce the scleral attachment of the muscle in man to relative unimportance, in this connection. It is necessary here to utilize one general deduction that may be drawn from such examination. It may be formulated thus: Fibrous bands of uvea attached to the periphery of the cornea, forming part of the " uveal meshwork of the iris angle," tend to become enclosed in hyaline sheaths—outgrowths from Descemet's membrane—in proportion to the intermittent pull placed upon the bands in accommodation. This is shown in the following comparison: In the horse, representing ungulata, a short thick tube of hyaline membrane surrounds for a moderate distance the exceptionally thick band of uveal meshwork that passes across to the iris at the mouth of the sinus of the chamber. In some sections an additional band of the meshwork of the sinus is found similarly enclosed in hyaline substance, a little further back. But that is all. See illustrations in Graefe-Saemisch.[3]

In the eye of a retriever dog, of which I have sections, representing the higher domesticated carnivora, there is a definite step onwards, showing, I think, the mode of development of the middle and inner trabeculae of man's pectinate ligament, some of which give origin to the radial muscle bundles. In the dog's eye, the sheaths of the uveal bands at the mouth of the sinus are much thinner than in that of the horse. But there are, in addition, some very long sheathed bands running back through the outer part of the long sinus towards the middle portion of the more developed ciliary muscle. The sheaths cannot be traced as far as the muscle. But it is only a step onwards from this stage to the sheathed muscle-heads that I have shown above in the human eye.

I do not suggest that this endothelial product, hyaline membrane, actually extends onwards further, still unchanged, into the muscle in man, to constitute the muscle cement. But I do suggest that the same influence that stimulates the endothelium of Descemet's membrane to proliferate, extending backwards and forming new hyaline sheaths, serves also to stimulate the morphological equivalents of the Descemet endothelium—the muscle fibres—to the formation of something closely allied to hyaline membrane.

In support of this suggestion is the fact that only in primates apparently do the fibres of the inner and middle portions of the muscle remain grouped in clearly cut bundles anteriorly, entirely free from admixture with white fibrous tissue, as they are further back. The clearly cut circular and radial fasciculi in man, separated by solid blocks of fibrous tissue, form a great contrast to the condition in the animals

above mentioned. In the horse, particularly, the intermingling of muscle fibres and of connective tissue fibres anteriorly is very marked, many of the muscle fibres becoming lost individually in the areolar tissue of the sinus of the anterior chamber. In the horse, it is the shortest outermost portion of the muscle only that has any direct connection with hyaline membrane. These fibres disappear in the strongly developed " scleral meshwork " of the sinus, which, stretching backwards from Descemet's membrane, forms a broad area of closely set thick cords, cut across transversely in meridional sections, each formed largely of a thick hyaline shell.

The cement of the ciliary muscle is comparable with the outer limiting membrane in two respects. Relatively poor quality in the case of both structures may be attributed to the fact that, regarded as hyaline membrane, they are *late developments* morphologically, and, in a sense, *end developments*. That the somewhat rudimentary hyaline quality of the external limiting membrane in man, already discussed, is a late development, is seen on searching for its representative in the horse, for example. In the latter, I have found it very difficult to demonstrate any continuous basement membrane beneath the pigment epithelium. There is certainly no selective staining.

The glass membrane quality of the muscle cement, if admitted, is obviously an end development of the mesodermal glass membrane of the eye, comprising also Descemet's membrane, the pectinate ligament sheaths and their backward extensions.

And if it be true, as I feel sure it is, that the inter-cellular cement of the two layers of ciliary epithelium, pigmented and unpigmented, consists of hyaline substance[4], the external limiting membrane may be regarded as the end development of a continuous ectodermal system, including lens capsule and zonule with the two limiting membranes and their intercellular connecting cement.

And the vessel-containing gap left between the outer limiting membrane and the ciliary muscle is *the only gap left in the hyaline multiple loop system that stretches across the eye* from the periphery of Descemet's membrane on each side, enclosing the lens, and drawn tight posteriorly by the extension of the ectodermal section of the system to Bruch's membrane in the choroid.

(III) Function

(1) *Of the cement of the pupillary dilatator.* There is apparently need for some resilient material, when the dilatator muscle is relaxed, to bring the base of the iris back into position automatically after each act of accommodation (see later, Part II). Fig. 4 is interesting in this connection, showing unusual evidence of slackness in the base of the iris—very uneven width and surfaces. The dilatator muscle, with its cement, does not extend peripherally as far as is usual; and there is an almost complete absence of the normal peripheral radiations of the muscle into the ciliary body. The result of the lack of the support normally afforded to the base of the iris by the muscle and its cement, and by its radiations, is seen in the photograph.

(2) *Of the cement of the pupillary sphincter.* There is a very obvious and serious objection to be met here: The extremely wide range of movement possible in the

pupil indicates a much higher degree of elasticity—the elasticity of rubber—in the cement of the sphincter muscle than one associates with hyaline membrane. But it is largely a question of degree, rather than of kind. The property of watch spring recoil is that required in an intermuscular meshwork of cement to bring back the pupil to a medium position of rest, either from pin-point contraction or from extreme dilatation.

(3) *Of the ciliary muscle cement.* There seems to be a *real need for* hyaline tissue in close association with the muscle. Apparently it has two uses, (*a*) and (*b*), varying with the state of the muscle:

(*a*) The primary need is to facilitate the action of the circular muscle bundles. The strong but elastic attachment of the more mobile section (inner two-thirds) of the ciliary muscle, provided by the glass membrane meshwork of the pectinate ligament, is needed to allow the circular muscle bands to move inwards towards the lens, as a ring muscle, and to draw them back after their contraction. If the heads of the radial muscle bands were attached to rigid immovable fibrous tissue, the circular muscle fibres on contraction would tend to be drawn outwards by the shortening radial bundles, and they would soon cease to exist as circular bundles.

And if the extensile and resilient pectinate ligament bands have developed largely to provide freedom of movement to the inner muscle fibres, it must be agreed that there is an exactly similar need for extensile and resilient tissue extending throughout the connecting radial muscle bundles, to link up the inner fasciculi with the pectinate ligament. This need should supply the necessary stimulus. Given the stimulus, some attempt at the secretion of a muscle cement with hyaline qualities must follow unless the homology between the muscle fibres and the endothelium of the pectinate ligament and of Descemet's membrane means practically nothing; or, in other words, unless the presumptive potentialities of the endothelial derivatives, the muscle fibres, remain for some obscure reason in abeyance.

(*b*) ***When the ciliary muscle is at rest,*** there is constant tension of the lens capsule and zonule, flattening the lens[5]. And the portion of this tension that is not borne ultimately by the choroid (Bruch's membrane and elastic tissue) must be transmitted to the cornea and sclera through the attachment of the ciliary body.

As shown later (Part III) by the process of exclusion, the *only tissues found to be available* in the muscle area to transmit this zonular tension, converging to the pectinate ligament, are the cement meshwork of the muscle and such elastic fibres as are to be found mixed up with the cement (Fig. 1). The total bulk of the elastic fibres is insignificant compared with that of the cement substance, and there is nothing so well suited to support the continuous pull of glass membrane as a meshwork of glass membrane itself, with its watch spring qualities.

If the muscle cement has this quality it must serve, not only for transmitting the pull of lens capsule and zonule, but also to distribute and equalize this pull in rapid changes of accommodation of the eye.

It is true that there is nothing to transmit the zonular tension from the external limiting membrane to the muscle cement except ordinary elastic tissue supplemented by loose collagenous fibres. There are three remarks to be made concerning this:

(1) On the whole there is less tension to be borne in this space between limiting membrane and muscle than in the muscle area, since there can be no tension at all here when the zonule is relaxed in accommodation.

(2) The elastic fibres crossing the space, connecting the ciliary muscle with the external limiting membrane, are much thicker, or more numerous (see Part III), than those found closely associated with the muscle, except possibly in the case of some circular muscle fasciculi (Fig. 1) that are so placed that they can bear no portion of the tension of the zonule.

But (3) in spite of this, in many eyes there is evidence that ***this hyaline-free gap constitutes a weakness, a serious defect.*** The gap throughout the corona, the elevated zone of the ciliary body, and in quite the anterior portion of the orbiculus, *tends to widen throughout life,* and this stretching may have a bearing on the origin of glaucoma in either of two quite different ways. (It is taken for granted that in estimating the width of this space in the ground-plate of the ciliary body, between the ciliary processes, oblique sectioning is avoided, and the measurements are taken quite in the depth of the valleys between the processes.)

Tendencies towards Congestive Glaucoma

(1) *The widening along the inner side of the ciliary body* can only form part of the mechanism of glaucoma production indirectly through secondary enlargement of the ciliary processes. That widening of the space must lead to secondary enlargement of the ciliary processes seems highly probable from the detailed anatomy of the region, given in Part III of this paper. The veins in the ground-plate (between and beneath the ciliary processes) lie suspended between two lines of elastic network in loose areolar tissue. The separation of the two lines of support must tend to dilatation of the veins, and this again to secondary dilatation of the offshoot veins in the ciliary processes, directly enlarging the processes. (2) Widening of the space immediately behind the iris may act also directly, since it means an advance of the ground-plate of the ciliary body towards the lens, directly narrowing the circumlental space.

These two influences lead to nothing very new in glaucoma causation. The subject, as regards primary congestive glaucoma, has been sufficiently worked out by Priestley Smith[6]. There are, however, some minor points of interest in the mechanism of the widening of the space:

(1) The widening along the inner side of the ciliary body may apparently be produced in two ways:

(*a*) The long zonular bundles (of fibres) and those of medium length, lying along the curved surface of the ciliary body, held in position possibly by the

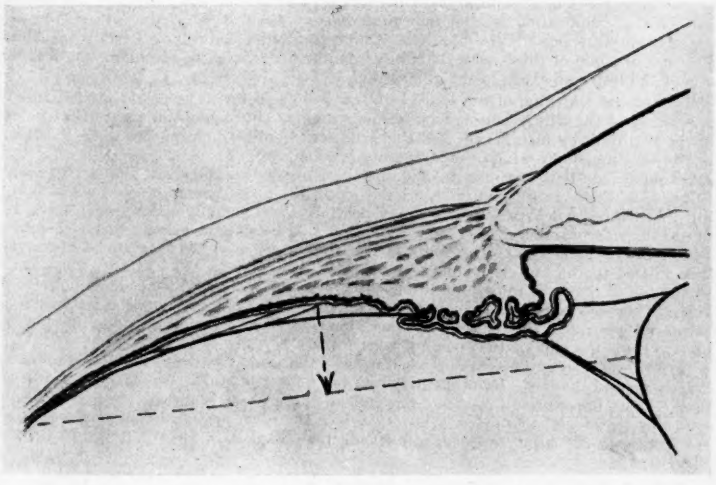

FIG. 7.

FIG. 8.

multiple origins of individual fibres and by the " orbiculo-ciliary " fibres (Fig. 8), and in the region of the ciliary processes by a few circular fibres, must ordinarily exert a slight inward traction on the ciliary surface. The elasticity of the zonule must tend to pull the ciliary surface to the position of a straight line drawn between the extreme ends of the zonule—a line drawn from the ora serrata to the mean attachment of the zonular fibres to the lens capsule. The direction of the pull on the ciliary body as a whole must be somewhere near that of the arrow in Fig. 7.

The degree of traction must be in proportion to the height of the curve of the surface of the ciliary body. Therefore in eyes with a very thick prominent ciliary body, due to bulky muscle, this indirect inward pull may be *nil* in parts; and therefore in these eyes there may be little widening of the space.

(*b*) But in those eyes with prominent muscle there may be very obvious direct traction of the orbiculo-ciliary fibres, each stretched like the string of a bow, and inserted at various points on the elevated corona, as in Fig. 8. The direct pull of these fibres must tend to draw the points of attachment inwards and backwards. This is emphasized by the fact that elastic fibres crossing the widened vessel-containing space of the ciliary body may be found continuing exactly the direction of some of these orbiculo-ciliary zonular fibres, clearly extending the traction of the latter onwards to the ciliary muscle.

Exceptional widening of the space in a few people seems to be partly attributable to narrowing of the ciliary muscle from senile wasting. But usually inward displacement of the two limiting membranes and their contained epithelium appears to be the chief, or the only means by which the stretching is produced.

In old people it is common to find the fasciculi in the middle of the muscle much thinned, while those seen in cross section along the inner border of the muscle, forming the " inner net " or " plate " may possibly have actually increased in thickness at the expense of the middle bundles. And this relative development at the inner border of the muscle may reasonably be attributed, in part, to traction of the zonule transmitted to the muscle by the elastic tissue seen in Figs. 17 and 19. Thus senile shrinkage of the total muscle area may be prevented or diminished.

In a few old eyes the space has been found quite narrow, from compression in advanced glaucoma, or from obvious meridional traction of varying origin. But in one or two cases the explanation has not been found.

(2) In many eyes the space between muscle and limiting membrane is widest immediately behind the iris. Reasons are given later for attributing this largely to traction of the short fibres of the zonule. The pull of these fibres is direct, towards the lens, and may therefore be sufficiently effective, in some eyes, apparently to extend through the tissues to the ciliary muscle, influencing that also.

(To be continued.)

ANNOTATION

Thomas Young, M.D., F.R.S.

May 10 saw the centenary of the death of Thomas Young, who ranks with Newton as one of the wonders of the world. It is fitting that a brief note of this anniversary should be made in an ophthalmological journal, for Young's contributions to ophthalmology, though perhaps undervalued in his life time, are recognized the world over to-day.

No better account of Young's ophthalmological contributions exists than that in the memoir contributed to the 19th volume of the Royal London Ophthalmic Hospital Reports. Here it is only necessary to recall his work which resuscitated and put the coping stone on previous work on the undulatory theory of light, his ingenious and far reaching experiments *in corpore vili* which laid the foundation of the astigmatic side of human optics, and his work on colour vision, which, elaborated by Helmholtz, is known as the Young-Helmholtz theory. But besides his fundamental work for our speciality we may recall that in connection with the nautical almanac, and finally his epoch-making researches on the Rosetta stone. Champollion, the French savant, shares the honour of these researches into the hieroglyphics of ancient Egypt, but the priority belongs to Young.

Young's memory is truly one of the chief glories of English science: he was "a man alike eminent in almost every department of human learning."

COUNCIL OF BRITISH OPHTHALMOLOGISTS

Annual Report

THE Council presents its report for the Session 1928-29. At the first meeting the following were elected as officers:—President: Mr. J. Herbert Fisher; Vice-Presidents: Sir John Parsons, Sir William Lister; Hon. Treasurer: Mr. M. S. Mayou; Hon. Secretary: Mr. Frank Juler.

The following were appointed to serve on the Executive Committee: The President and Secretary (*ex officiis*) with Sir John Parsons, Sir William Lister, Mr. M. S. Mayou and Mr. W. H. McMullen.

A Committee enquired into the conditions under which children from extra-metropolitan areas are admissible into the White Oak Ophthalmia School at Swanley, Kent. The Council adopted the report of the Committee, and copies were sent to the Ministry of Health, the Board of Education and the Metropolitan Asylums

Board. Replies have now been received, and the Council is asking the Ministry of Health to receive a deputation.

A further interim report on Industrial Eye Diseases and Injuries has been prepared and presented to the Council by the Committee appointed to investigate this subject. The Council hopes that further useful information will be available in a year's time; in the meantime permission has been given for some of the work done to be published, and this has been incorporated in a paper read at the Annual Congress of the Ophthalmological Society of the United Kingdom.

A Committee has been appointed to enquire into the constitution and working of the so-called Refraction Hospitals.

Certain questions of ophthalmic interest have been referred to the Council and have received due consideration.

With a view to enlarging its membership, the Council recommends that there be an increase in the number of members elected annually, and that the rules drawn up for the work of the Council be altered so that there shall be twelve members elected annually, five by the Council of the Ophthalmological Society of the United Kingdom, five by the Council of the Section of Ophthalmology, Royal Society of Medicine, and two by the Oxford Ophthalmological Congress. The Council also recommends an alteration of the rules so that the Executive Committee shall consist of eight members, instead of six, as heretofore.

The Council desires to thank the Council of the Royal Society of Medicine for the use of rooms for meetings, and the National Committee for the Prevention of Blindness (U.S.A.) for continuing to send copies of its publications.

As in former years, the expenses of the Council have been defrayed by contributions from its members.

REPORT OF THE ANNUAL CONGRESS OF THE OPHTHALMOLOGICAL SOCIETY OF THE UNITED KINGDOM, 1929

THE Ophthalmological Society of the United Kingdom held its Annual Congress in London at the House of the Royal Society of Medicine, from April 11—13, under the presidency of MR. CHARLES HOWARD USHER.

The Transactions of the Society publish a full account of the papers and discussions: merely an indication of these is given here.

The first paper was read by MR. TREACHER COLLINS on "Formative fibrous tissue reaction in the eye." Mr. Treacher Collins classified the conditions giving rise to this reaction as follows:

(1) Encapsulating fibrosis: found in connection with foreign bodies, neoplasms, and parasitic cysts.
(2) Post-fibrinous fibrosis in connection with blood clots.
(3) Reparative fibrosis found in connection with developmental defects, the healing of wounds, and as a sequel to granulomatous inflammation.

MR. F. A. WILLIAMSON-NOBLE read a paper on "Graded Squint Operations," in which he described his procedures for muscle advancement according to the results of measurement. To measure the angle of deviation he uses the Maddox tangent scale, and also works with the Maddox rod and prisms. He advocates operation under general anaesthesia and approves of the results of recessions.

MR. M. HEPBURN read a paper on "Some unsolved problems in connection with diseases of the choroid." He maintains that primary pigmentary degeneration of the retina is not due to nerve degeneration (the abiotrophic theory of Treacher Collins and others) but to defects in the choroidal circulation. Mr. Hepburn explained how the variations and the sector-shaped defect in the visual fields were brought about in cases where there existed inflammatory deposits and scars in the choroid. He believes that vascular diseases of the choroid are more likely to end in optic atrophy than the inflammatory forms. Mr. Treacher Collins discussed the paper at length.

MR. CLARK SOUTER reported a case of uveo-parotid fever, and gave an account of the autopsy findings.

THURSDAY AFTERNOON was devoted to a discussion on "Heterophoria."

DR. E. E. MADDOX (Bournemouth) defined orthophoria as "a tendency of the eyes to set themselves truly at the object of fixation," and heterophoria as a departure from this. He stated that there are 12 species of paretic heterophoria, and twelve of concomitant. When testing for heterophoria Dr. Maddox emphasised the importance of keeping the disc of rods perpendicular to the line between the eye and the light. He has found it convenient to use a hand trial frame, which could be held in front of the ordinary trial frame, the former having rods on one side and a rotating prism or pair of prisms on the other. He maintains that it is impossible to make rigid rules for the treatment of this condition. Most minor degrees of heterophoria do not need treatment. Attention to the general health, foci of infection, and the correction of refractive errors is advocated. If refractive treatment fails, the choice lies between exercises or prisms; the former are more suitable for the young, and the latter for the old. A weak prism for a high degree of exophoria is often

of great value as it is the last degree of stretch on the fusion reflex that is the most fatiguing. Operation is suitable in selected cases.

MR. CHARLES GOULDEN followed and said that it was important to be certain of the type of deviation, *i.e.*, concomitant or paralytic. He stated that hyperphoria causes the most inconvenience of all the heterophorias, but that only when the vertical deviation produces symptoms should it be treated, and then by prisms. If the prism needed for correction was 2° or more it should be equally divided between the two eyes, the base being downwards before the affected eye and upwards for the other. The high degrees of hyperphoria might need operation. Mr. Goulden described four patients suffering from torticollis due to hyperphoria, and a patient suffering from spasm of convergence due to hysteria.

GROUP-CAPTAIN E. C. CLEMENTS (R.A.F.) spoke of his experiences in the Air Force, where pilots in spite of having good vision make faulty landings. He believes that this is due to defective muscle balance, and that heterophoria is influenced by malaria, sand-fly fever, and other conditions in tropical countries. The men are treated by exercises.

MR. ERNEST CLARKE said that in the civil population heterophoria was very common, but, as it was usually of a minute degree, it was unimportant. When minus glasses were necessary there might be a slight degree of exophoria, for these glasses always lowered the amplitude of convergence.

MR. H. B. GRIMSDALE said that patients suffering from heterophoria were sometimes greatly helped by 0.25 cyl. and by a 1° prism.

MR. HUMPHREY NEAME agreed that in hyperphoria a prism of the lowest degree possible should be used in order to relieve discomfort.

MR. HARRISON BUTLER said that for elderly patients with convergence insufficiency the relief afforded by the prisms allowed the muscles to repair, and that later the prism could be discarded.

MR. WILLIAMSON-NOBLE described his method of testing for cyclophoria by means of tilted mirrors.

ON FRIDAY, APRIL 12, Mr. W. S. DUKE-ELDER read a paper on "The Nature of the Vitreous," illustrated by the epidiascope.

He described the structure of the vitreous as seen by the slit-lamp and the ultra-microscope, an instrument first utilised in this study in 1923. The vitreous is a pure homogeneous gel, *i.e.*, of the consistency of gelatin, and it is derived chiefly from the ectoderm in the vitreous cavity. On the surface of the vitreous are forces which aggregate together the micelle in close formation. In most cases the chemical composition of the vitreous is the same as that of the aqueous in regard to the nitrogen and salt content, but in addition

there is present a muco-protein to keep it transparent, and a kerato-protein to preserve it in the state of a gel.

MR. MAURICE WHITING read a paper on " Optic atrophy following haemorrhage from the alimentary tract." He said that the condition might follow haemorrhage from any source, but that it was more commonly a sequel to bleeding in the alimentary tract or from the uterus. In his opinion the atrophy was due to the sudden death of the nerve fibres.

MISS MANN gave an interesting demonstration of the phylogenetic value of the lower visual field.

MR. EUGENE WOLFF contributed a paper on " The pathology of orbital haemorrhage and inflammation." He believes that the delayed absorption is due to the fact that the orbital fat is poorly supplied by blood vessels, and that when the muscles of the eye have yielded to the full extent of their elasticity the orbit becomes a closed space and that the increased intra-orbital pressure brings about compression of the veins, giving rise to venous stasis, transudation, and delayed absorption.

MR. G. F. ALEXANDER gave a lecture on the great antiquity of removal of cataract, and offered suggestions on the instrumentation of cataract operations.

FRIDAY EVENING was devoted to a discussion on the diagnosis and treatment of ocular tuberculosis.

SIR ARNOLD LAWSON opened the discussion. He pointed out that ocular tuberculosis as an accompaniment of phthisis was very uncommon, and that the most common tuberculous lesion of the eye is iridocyclitis. He opposed the use of Calmette's local conjunctival test as being too dangerous. He dealt with the treatment from the general and local points of view. Sir Arnold gave statistics of 42 cases treated with tuberculin, 10 per cent. of whom showed no improvement, and in 45 per cent. healing followed its use. He spoke of the good that followed photo-therapy and mentioned that the value of local ultra-violet rays was still *sub judice*.

DR. R. A. YOUNG dealt with the systemic aspect of the disease. He advised caution in tuberculin treatment, and said that in the active stages both tuberculin and artificial sunlight could do harm.

MR. S. H. BROWNING dealt with the subject from the bacteriological point of view. He spoke of the difficulty in diagnosis. He had used bovine and human tuberculin in the treatment of ocular tuberculosis for 15 years and had little doubt as to its value.

MR. A. L. WHITEHEAD emphasised the importance of a thorough search for a tuberculous lesion elsewhere in the body when ocular tuberculosis was suspected. He believed in the value of tuberculin treatment when begun very gradually.

MR. W. S. DUKE-ELDER said that he regarded phototherapy as an adjunct to ordinary treatment. He gave statistics of 33 cases treated at Moorfields.

DR. G. MACKAY and MR. M. S. MAYOU also took part in the discussion.

ON SATURDAY, APRIL 13, MR. BERNARD CRIDLAND opened a discussion on " Minor eye injuries in industry." He divided the cases into three main groups :—

(1) Small flying particles. Grindstones, emery wheels, etc.: 51 per cent.
(2) Flying chips of metal. 26 per cent.
(3) Miscellaneous. Mining, road making, general labour, etc.: 23 per cent.

In 70 per cent. of the cases there was no protection used; in 19 per cent. protection was supplied but not used; and in 11 per cent. protection was used but was ineffective.

Mr. Cridland suggested three main lines of prevention :

(1) Mechanical guarding.
(2) Education of workmen and foremen in this subject.
(3) Engineering revision.

He said that good goggles afforded 100 per cent. protection and mechanical shields 90 per cent.

Mr. J. H. Fisher, Mr. Treacher Collins, Mr. John Rowan, Mr. Cyril Walker, Mr. J. F. Cunningham, Mr. M. Hine, Dr. G. Mackay, and Mr. A. L. Whitehead discussed this subject, and Sir John Parsons pointed out that American employers in engineering shops took a stronger line than British employers in insisting on workmen using adequate protection.

A clinical meeting was held at the Royal Westminster Ophthalmic Hospital and many interesting cases discussed.

A visit was made to the National Physics Laboratory at Teddington.

During the Congress two rooms were set apart as a museum for ophthalmic appliances, pathological specimens, drawings, and literature. The exhibits included goggles damaged during use at various trades.

The Annual Dinner was held at the Langham Hotel on Thursday, April 11. The President, Mr. Charles Howard Usher, took the chair and proposed the health of the Society. He gave a most interesting survey of the history of the Society and its distinguished members in the past. He presented to us a forecast of a future Congress, which might avail itself of the advantages afforded by travelling at record speed in the air or on land, and obtain the presence of eminent foreign ophthalmologists at a few hours notice. This toast was responded to by Mr. Treacher Collins who touched humorously on the foresight shown by those " original members " who many years ago compounded for their life membership in the place of an annual subscription and thereby had scored financially. He also related how the fund for the Tran-

sactions came to benefit as a result of the bomb outrage in Bartholomew Close during one of the German air raids, when certain copies of the Transactions, destined for the libraries of ophthalmologists in enemy countries were destroyed, but fortunately were covered by insurance.

Mr. J. B. Lawford proposed the health of the President and Chairman.

At the Annual General Meeting the following officers were elected for 1929-1930:

President: Leslie Paton; Vice-Presidents: A. L. Whitehead, Rayner D. Batten, W. H. McMullen, O.B.E., C. H. Usher; Treasurer: Sir Arnold Lawson, K.B.E.; Council: C. Goulden, O.B.E., A. F. MacCallan, C.B.E., J. Jameson Evans, Lt.-Col. A. E. J. Lister, H. P. Gibb, P. G. Doyne, and Presidents of Affiliated Societies; Secretaries: M. L. Hine, M. H. Whiting, O.B.E.

Professor Elliot Smith was elected an honorary member of the Society.

A resolution was passed to the effect that all past presidents of the Society should be members of the Council (*ex-officiis*).

ABSTRACTS

I.—UVEA

(1) **Bistis, J. (Athens).—A clinical and experimental study concerning the rôle of the sympathetic in the aetiology of heterochromia. (Etude clinique et expérimentale sur le rôle du sympathique dans l'étiologie de l'hétérochromie.)** ***Arch. d'Ophtal.***, September, 1928.

(1) An abstract of the usual length would give a wholly inadequate interpretation of this long and interesting communication. It is in two parts: (1) *Clinical*—in which **Bistis** deals in detail with cases recorded by himself and many other writers and their bearing on the question under discussion: (2) *Experimental*—in which the results of experiments and observations on animals, carried out by Bistis and others are recorded and discussed. This latter part is illustrated by photographs of the eyes and irides of rabbits.

The author's "conclusions" are:—

(1) Congenital or acquired heterochromia, when not preceded by intra-ocular inflammation, should be regarded as the sequel of paralysis of the cervical sympathetic; this is demonstrated by clinical evidence and corroborated by experiments on rabbits by removal of the superior cervical ganglion.

(2) Rarefication of the pigment in the stroma of the iris has been shown by histological examination of the irides in experimental heterochromia.

(3) The presence of precipitates on the posterior surface of the cornea in such cases, is not to be accepted as the result of cyclitis, but as due to vaso-motor disturbance, following paralysis of the cervical sympathetic.

(4) Cataract, noted in association with heterochromia, should not be considered as secondary to cyclitis, but as a change in the lens probably due to disturbance of the intra-ocular equilibrium induced by vaso-motor trouble.

(5) To the syndrome of Claude Bernard-Horner heterochromia should be added.

A long and valuable bibliography is appended.

J. B. LAWFORD.

(2) **Morelli, Enrico (Pisa).—A contribution to the study of Doyne's choroiditis. (Contributo allo studio della coroidite di Doyne.)** *Boll. d'Ocul.*, Anno. VII, No. 10, p. 1032, October, 1928.

(2) The case described by **Morelli** in a man, aged 69 years, seems to conform, as far as the ophthalmoscopic appearances go, with the honeycomb type of familial choroiditis described by Doyne in 1899. The general conclusions drawn from his own and the other recorded cases are that: (1) the condition usually commences between the twelfth and nineteenth year; (2) there are usually in the later stages slight traces of optic atrophy; (3) there is no lesion affecting the retinal vessels; (4) light and colour sense remain normal; (5) there is no evidence of heredity in the disease. Further, he is of opinion that the lenses show a peculiar form of punctate cataract, and that the condition may be accompanied by a slight degree of mental degeneration, that it is of a distinctly progressive character, and that there is no evidence of any comparable degeneration in the auditory apparatus.

LESLIE PATON.

(3) **Bargy, Maurice (Perpignan).—Three cases of iridocyclitis due to trypanosomiasis. (Trois cas d'iridocyclite à trypanosomes.)** *La Clin. Ophtal.*, May, 1928.

(3) The reviewer has spent some time in the endeavour to ascertain the precise part of the world (evidently a very undesirable part) in which **Bargy** was working when he treated no fewer than 476 cases of sleeping sickness due to *trypanosoma Gambiense*. Bargy is resident in France, and has practised in Tong-King, but a reference to this latter in the Atlas produced no place resembling Haute-Volta to which he refers. The only Volta in the Gazetteer

is a river in the Gold Coast Colony, and since this seems a very likely place for trypanosomes one must assume that this is the part of the world referred to, and in which whole villages are wiped out by the parasite. Bargy's article should really be read in the original by those who are interested in tropical eye diseases, though it seems clear that even they are not likely to see many cases of the type here described. The author only found three in 476 cases of trypanosomiasis. There are other ocular complications probably due to this organism, of which Bargy has heard, but it is impossible to be certain of their origin on account of the difficulty of diagnosis of trypanosomiasis and the frequency in this country of all sorts of other indigenous eye affections. Bargy describes the three cases in full. The first will perhaps suffice. "Dibiri, of the Birifon race, a vigorous fellow of herculean build, aged 25 years, came to the consultation on account of 'blood in the eye.' There was in the left eye a little pericorneal injection, a hyphaema and there was also a small subconjunctival ecchymosis. Seen with the binocular loupe there was in the lower inner quadrant of the iris a tiny clot the size of a pin-head, indicative of the vessel which had bled. The pupil was contracted, and dilated with atropine with difficulty, revealing three posterior synechiae and a small exudate on the anterior capsule. Slight ciliary pain on pressure, slight photophobia, periorbital and frontal pain. In ten days under ordinary treatment (there was no sign of syphilis) the iridocyclitis was cured. At no time did the presence of trypanosomiasis occur to my mind." Six months later this previously strong man returned, a wreck, suffering from sleeping sickness; was treated for a month with atoxyl, and as soon as he was got upon his feet, insisted on leaving hospital and so discontinuing the treatment. He failed to return, and died of this terrible disease a year later. The second case died six months after deserting from the hospital with his eye symptoms cured, while the third case, also cured of eye symptoms, died within four months, the general symptoms of trypanosomiasis having been actually present from the first date of examination.

"In these three cases" says the author, "there were the four signs which have already been described as characteristic of iridocyclitis due to this trypanosome, namely, ***unilaterality, fugitiveness, benignity*** of the lesions, and tendency to ***frequent recurrence***." To these four he adds ***iridic haemorrhages*** due to parasitic embolism, revealed, according to the amount of blood effused, either by hyphaema or by a rusty tint of the aqueous. While haemorrhages may occur in other forms of iridocyclitis, these are usually severe, whereas in trypanosomiasis they may be so slight as to pass unnoticed. "At any rate, the association of these five signs in the case of a mild iridocyclitis ***(iridocyclite de symptômes atténués)***

occurring in a patient coming from an affected region, ought to draw one's attention to the possibility of the ocular disease being a complication of sleeping sickness. It is well to remember that the aetiological diagnosis is a very difficult matter, since the irido-cyclitis comes on almost always in the pre-hypnosic period, that is to say at a time when the trypanosome is for the most part unrecognised."

For the guidance of others the author then summarises the principal signs and symptoms of trypanosomiasis.

ERNEST THOMSON.

(4) **Shahan, W. E. (St. Louis, Mo.).—Panophthalmitis, evisceration, sympathetic ophthalmia.** *Amer. Jl. of Ophthal.*, February, 1927.

(4) **Shahan's** case occurred in a man aged 31 years, who had sustained a penetrating injury of the left eye, and developed panophthalmitis, which partly subsided, leaving the eye in a painful condition. Evisceration was performed 15 days after the injury, special care being taken to leave no uveal tissue. The vision of the right eye was normal until 20 days after operation, when it became slightly blurred. A day later some flush developed, but slit-lamp examination failed to reveal any keratic precipitates or increase in the cellular contents of the aqueous. There was a definite risk of sympathetic ophthalmitis, however, so the stump left after evisceration was removed. A few days later iritis and keratic precipitates developed in the right eye. Atropine was used, and the patient was put on to 30 grs. of sodium salicylate three times daily and a dose of 0.6 gram. of neosalvarsan was given. The eye gradually improved and eventually made a complete recovery. The case was probably one of sympathetic ophthalmitis, since the Wassermann reaction was negative, and no evidence could be found of focal infection, but it is doubtful whether it was due to the insufficiency of the evisceration. The operation was about 15 days after the injury and cases have been reported, following enucleation done earlier than this. Pathological investigation of the excised stump showed the posterior emissary blood vessels and nerves densely covered with lymphocytes in the inner two-thirds of the sclera. In several places these lymphocyctic coverings were continuous with dense lymphocytic masses in the posterior part of the ocular sac.

F. A. WILLIAMSON-NOBLE.

(5) **Fietta, P. (Fribourg).—A case of pearl cyst of the iris. (Un cas de kyste perlé de l'iris.)** *Rev. gén. d'Ophtal.*, February, 1928.

(5) This is a very interesting and instructive short article in which **Fietta** draws attention to the difference between the com-

paratively common serous cyst of the iris and the pearl cyst, in which, instead of a cavity, there is a more or less solid growth of concentric layers of epithelial cells arranged like the coats of an onion. While, in the serous type, simple puncture or partial excision may suffice (although excision with iridectomy is the operation of choice), in the pearl cyst excision with iridectomy is the only possible procedure. Lagrange insisted that these pearl cysts should be operated on early, even when the growing structure has not yet caused any symptoms, while some authors such as Rothmund, Critchett, and Treacher Collins have reported cases of sympathetic ophthalmitis. The author then relates what turned out to be a very unfortunate case of pearl cyst in his own practice. A little girl, aged 15 years, who had had an eye accident more than a year previously, presented a pearl cyst of the iris from which could be seen projecting an eyelash. The eye was perfectly quiet; nevertheless Fietta advised immediate operation. This was refused, but a month later the child was brought back with the eye painful and inflamed. Operation was now undertaken but proved to be most laborious as the tumour simply broke in pieces which had to be recovered by repeated use of the forceps. The operated eye seemed to be doing well when, three days later, irritation of the fellow eye began and was not checked until "fearing a sudden explosion of sympathetic ophthalmitis" Fietta excised the operated eye. Thereafter the sympathiser recovered and in 1925 was normal with full visual acuity. "Who can tell," says the author, "whether if the eye had been operated on a month earlier, when it was quiet, there would have been this irritation of the fellow eye. . . . . The rule is clear in such a case as this. Operate without delay even if the wounded eye shows no signs of irritation and seems to tolerate its cyst without the least inconvenience. The results cannot but be better and the chances of preserving the eye more numerous."

ERNEST THOMSON.

(6) **Kreutzfeldt.—On hypopyon iritis. (Beiträge zur Hypopyon-Iritis.)** *Zeitschr. f. Augenheilk*, Vol. LXVI, p. 243, 1928.

(6) In reporting three cases of iritis associated with hypopyon, **Kreutzfeldt** discusses the question whether this association represents a distinct clinical entity or is merely a complication of iritis due to different causes. The interesting feature of hypopyon seen in connection with iritis is the tendency to recurrence, and it is mainly on this characteristic that German writers like Gilbert have advanced the view that there is a uniform exciting cause, and have styled these cases as "*irido-cyclitis septica*." Regarding this condition as of metastatic origin, it may be considered as being intermediate between iritis and ophthalmitis; indeed a generic name

of "ophthalmia lenta" has been suggested. In the opinion of the author it is of more concern to try to establish the cause in any particular case. His own cases showed nothing in common in this respect. One appears to have been definitely syphilitic in origin; another was probably tuberculous, and the third followed on a cataract extraction.

A. SOURASKY.

II.—GLAUCOMA

(1) **Basso, Prof. (Genoa).—On glaucoma compensated by miotics. (Sul Glaucoma compensato dai Miotici.)** *Ann. di Ottal. e Clin. Ocul.*, Year LVII, p. 11, 1929.

(1) **Basso** in this article deals with six cases in which, for various reasons, operation could not be undertaken and in which the sole dependence had to be placed on miotics in the treatment of the cases. In two of the cases, after six months treatment, the intraocular tension had come down to normal, the anterior chamber was of full depth and all symptoms had disappeared. These two have remained normal for four and six years respectively. In the other four cases, no advance of symptoms have manifested themselves over a period of five years. In the light of these cases the author discusses the question as to the extent to which it may be desirable to depend on miotics, intensively used, in the treatment of early glaucoma.

LESLIE PATON.

(2) **Safar, Karl (Vienna).—On increased tension following juvenile haemorrhages in the retina and vitreous, and thrombosis of the central vein due to tuberculous phlebitis, together with remarks on the origin of tubercle of the retinal vessels. (Ueber Drucksteigerung im Gefolge der juvenilen Netzhaut-Glaskörperblutungen und Verschluss der Zentralvene infolge tuberkulöser Phlebitis, nebst Bemerkungen ueber die Entstehungsweise der Netzhautgefässtuberkulöse.)** *Arch. f. Ophthal.*, Vol. CXIX, 1828.

(2) **Safar** points out that secondary glaucoma following recurrent haemorrhages in the retina and vitreous in young adults is not so rare as was formerly supposed. It may supervene in severe cases, where the clinical and histological changes in the posterior portion of the eye present the same appearances as in thrombosis of the central vein.

In the two cases which he examined microscopically the glaucoma was caused by closure of the angle of the anterior chamber and the formation of a membrane on the anterior surface of the iris,

which again arose from numerous haemorrhages in, and in front of the retina, due to disease of the retinal vessels. Another complication may occur in the form of an iridocyclitis, which may also give rise to an increase of tension. Other changes, more rarely observed in these cases of juvenile disease of the retinal vessels, are tuberculous leptomeningitis of the optic nerve, retrobulbar infiltrations in the septa of the nerve, and ciliary perineuritis.

As regards the mode of development of this disease, it is generally admitted that these haemorrhages are due to an inflammation of the retinal vessels, more particularly the veins, which presents the histological characteristics of a tuberculous phlebitis: this phlebitis has in most cases a direct haematogenous origin, though it may also occur as an extension of a tuberculous process in the uveal tract or the papilla.

This inflammation attacks mainly the small retinal veins, but the larger veins and even the central vein in the optic nerve may become affected; the retinal arteries may also be secondarily involved.

THOS. SNOWBALL.

(3) **Schmidt, Karl (Bonn).—Investigations regarding derangements of capillary endothelium in glaucoma simplex. (Untersuchungen ueber kapillar Endothel-Strörungen beim Glaucoma simplex.)** *Arch. f. Augenheilk.*, Vol. XCVIII, January, 1928.

(3) In view of the fact that researches into the causation of glaucoma are conflicting and by no means decisive of the question of a general disorder of the organism, **Schmidt** finds justification for the recording of results of investigation from other points of view, and by methods hitherto unused in ophthalmology.

His conclusion is based on the drink-test applied to sixteen patients subject to glaucoma simplex who were otherwise quite healthy. The procedure is as follows: To regularise the intake and output of water by the body, for two days prior to the test, the patient is given 1,000 gm. of water per day besides what enters with his normal mixed diet; the ingestion of salt is kept at a minimum. He is made to fast for 12 hours prior to the test. Immediately preceding the test the specific gravity of the urine and the haemoglobin content of the blood are measured. Then the patient is made to drink a litre of water as quickly as possible, *i.e.* within 5 minutes. In the first hour after the intake of water every 15 minutes and then every 30 minutes the blood is tested. The urine is examined every 30 minutes. The experiment lasts from 4 to 4½ hours. In this way the variations in the quantum of blood plasma as measured by the haemoglobin content is ascertained and hence the function of the capillary endothelium is also tested.

In normal healthy individuals the changes in the blood and urine run a typical course during the experiment. In all but one of the 16 glaucoma patients put to the test the course of the changes either in the blood or in the urine or in both was more or less atypical. According to Schmidt, this discrepancy points to the existence of a disorder of the capillary endothelium in clinically healthy glaucoma patients, and probably glaucoma is the expression of this capillary disorder in the eye.

D. V. GIRI.

(4) **Domenico, Rossi (Florence). Astigmatism against the rule and glaucoma. (Astigmatismo inverso e glaucoma.)** *Boll. d'Ocul.*, Anno. VII, No. 10, p. 1,047, October, 1928.

(4) **Domenico,** in this article, discusses the various hypotheses that have been advanced from the time of Helmholtz onwards as to the relationship between glaucoma and reversed astigmatism, *i.e.*, whether (1) there is any relationship; (2) if so, is astigmatism against the rule a causal factor in the occurrence of glaucoma, or (3) is it the consequence of the slight rise of intraocular tension in the early stages of glaucoma. Morax lays great stress on the importance of regarding every case of astigmatism against the rule as a possible, if not a probable, subject for glaucoma, and that the inverse astigmatism precedes the hypertension. Domenico's research was directed to the examination of the grounds for this opinion. His general conclusion is that in the present state of our knowledge of the genesis of glaucoma there is not enough to justify us in considering inverse astigmatism as a factor predisposing to glaucoma, but that we must rather think of them both as having one factor in common, old age.

LESLIE PATON.

(5) **Goldenburgh, Michael (Chicago).—Closure of the drainage angle.** *Amer. Jl. of Ophthal.*, April, 1928.

(5) **Goldenburgh** opens his paper by a brief résumé of Duke-Elder's work on the production of the aqueous by dialysis. He then quotes Krogh's work on the capillaries which shows that these vessels have a modified muscle layer consisting of oblong cells with many prolongations (Rouget cells). These are subject to contraction and dilatation under various stimuli, and the capillaries are thus not merely passively distended by arterial blood pressure but possess a tonus, and may show contractions and relaxations of their own, independent of the artery. Under normal conditions the capillaries in, say a muscle, are not all dilated or contracted at the same time, but a goodly proportion may be dilated while a like number may be contracted. They may contract to such a degree as to inhibit the passage of a single blood

cell or dilate sufficiently to allow the passage of several cells at one time. Dilatation of the capillary is accompanied by an increase in permeability and this may increase to such an extent as to allow the passage of all the colloids in the blood plasma. This dilatation may be brought about by the presence of irritants or hormones in the blood, *e.g.*, urethane in experimental animals produces an enormous dilatation of the capillaries. Now the ciliary body contains a relatively enormous number of capillaries and it is not difficult to understand how, in the presence of some irritant substance in the blood, dilatation of these will result in swelling of the whole structure. If the retro-lental space be small this swelling will cause the root of the iris to be pushed forwards and block the entrance to the canal of Schlemm thus precipitating an attack of glaucoma, and bringing about the formation of the familiar peripheral anterior synechia.

F. A. WILLIAMSON-NOBLE.

(6) **Wilmer, W. H.—Operative treatment of glaucoma.** *Trans. Ophthal. Soc. U.K.*, 1927.

(6) **Wilmer,** speaking at the Oxford Ophthalmological Congress, gave an analysis of the results obtained by various surgeons with the chief operations used in glaucoma, and said that in his experience the operation of choice was that of corneo-scleral trephining. He uses a 2 mm. trephine, and performs a complete iridectomy, followed by syringing of the anterior chamber with normal salt solution. The conjunctival flap is sutured with fine catgut. Atropine is used freely after the operation. In cases where the conjunctival flap is thin he dissects up a piece of Tenon's capsule, about 4 by 6 mm., and places this as a free graft over the trephine opening underneath the conjunctiva, the scleral surface being downwards.

He thinks iridectomy still deserves a place in acute glaucoma, especially if cataract is present.

" Cyclodialysis is valuable in glaucoma with retinal haemorrhages; in secondary glaucoma with closed pupil; in cases with a very narrow chamber; in certain cases of very high intraocular pressure; in very old people with arterio-sclerosis; and in certain cases after cataract extraction."

Small-flap sclerotomy he considers too difficult and complicated for the average ophthalmic surgeon, and Holth's punch operation to have no advantage over Lagrange's or Elliot's operation.

Iris incarceration he thinks easy but risky. The Lagrange operation he uses under certain conditions, especially when the tension is below 35 Schiötz.

G. G. PENMAN.

III.—LENS

(1) **Giannantoni, C. — On the relations between congenital cataract and alterations in the neuro-vegetative system. (Sui rapporti tra Cataratta congenita ed alterazione dell apparato neuro-vegetativo.)** *Ann. di Ottal. e Clin. Ocul.*, p. 1063, Year LVI.

(1) **Giannantoni** has undertaken a very full physical and chemical examination on twelve subjects of congenital cataract to try to determine if they show variations in the sympathetic or autonomic nervous systems or in the glandular secretions which could be correlated with the development of the cataract. He reviews the various hypotheses which have been advanced to explain the causation of congenital lamellar cataracts. He cites Grönholm's classification of juvenile and pre-senile cataracts:—

A. *Due to glandular defects.*

1. Diabetic: Pancreatic hypofunction.
2. Tetany: Parathyroid hypofunction.
3. Myotonic: Thyroid and parathyroid hypofunction.
4. Acromegalic: Hyperfunction of anterior lobe of hypophysis.
5. Diabetes Insipidus: Hyperfunction of pars intermedia of hypophysis.
6. Pluriglandular: A group not clearly delimited.

B. *Not associated with glandular defects, i.e.*, produced by poisons acting directly on the lens and not indirectly through the glands, *e.g.*, ergotine, and thallium.

Briefly, Giannantoni's own conclusions from the twelve cases he has examined are that there is not sufficient evidence of any glandular disfunction to justify any conclusions being drawn. "My researches, however, do not allow me to admit the existence of any such relation"; (*i.e.*, between cataract and glandular disfunction) "at least, it is not demonstrable by ordinary methods of investigation, but my observations and researches authorise me to conclude that in seven of the twelve cases, there was a predominantly vagotonic constitution and in the other five, equilibrium between the two systems and in no case signs of a sympathetic hypertonicity. Only further and more numerous researches can determine whether we can attribute to this fact any decisive importance in the pathogenesis of congenital cataract."

LESLIE PATON.

(2) **Lenhard, Oscar (Leipzig).—Regeneration of the lens in the absence of the thyroid gland. (Linsenregeneration bei Schilddrüsenmangel).** *Arch. f. Ophthal.*, Vol. CXX, 1928.

(2) **Lenhard** in this article records the results of an enquiry into the influence of a disturbance of metabolism upon the regeneration of the lens; for his experiments he selected newts, from which he removed the thyroid gland.

It was found that if the lens was extracted 3 to 26 days after excision of this gland and the eyes were examined 12 to 26 days after, there was no arrest in the normal regeneration of the lens. When, however, 30 to 50 days were allowed to elapse after removal of the thyroid gland before the lens extraction, he obtained in three out of a series of twenty-one animals, after 23 days, signs of a very definite arrest of development and hypoplastic malformation of the lens.

The author, however, hesitates to say whether this is the direct result of the absence of the thyroid gland; the fact, that in this series the regeneration of the lens was in so many cases unaffected, he would explain on the ground that the animals had not been left sufficiently long in the athyroid condition, or that the loss of the thyroid gland had been compensated for by the action of other endocrine glands.

THOS. SNOWBALL.

(3) **Greenwood, A. (Boston).—Mental disturbances following operations for cataract.** *Jl. Amer. Med. Assoc.*, December, 1928.

(3) It has been estimated that in from 2 to 3 per cent. of all cases of cataract some mental disturbance develops following the operation. Similar mental states may follow any operation in persons of neurotic disposition, but they are much more frequent in operations which involve bandaging both eyes. The various degrees of mental instability may occur at any time after the operation varying from a few hours to several days. They most commonly occur on the first or second night after the cataract operation. The patient may be merely distressed, or delirious, or maniacal.

Greenwood considers it advisable to be really optimistic about the result of his operation, in order to give confidence to the patient. He thinks it better to promise too much than too little.

There are drugs which are of help in quieting the patient such as barbital and phenobarbital on going to bed the night before operation, and again the first thing next morning.

No patient with cataract should be allowed to go through the first night without a nurse sitting beside the bed. In case of pain or restlessness two or three hypodermic injections of 1/12 grain of

morphine with 1/200 grain of hyoscine may be given. If there is backache a bed-rest may be used ten or twelve hours after the operation. However, nothing is so remedial as removal of the bandage from the unoperated eye, if it has sufficient vision to take in the surroundings, and see the face of the nurse. Frequently, in a patient otherwise well, some accidental injury to the operated eye may produce a haemorrhage into the anterior chamber, which besides being annoying for the operator is depressing for the patient; it is therefore advised that some efficacious protective dressing or cage be applied for at least three weeks after the operation, to prevent the possibility of self-injury during sleep. The author reminds us that the attempt of an inexperienced nurse to put drops into the eye shortly after operation may be attended by haemorrhage, prolapse of iris, or reopening of wound.

A. F. MACCALLAN.

(4) **Rollet, Prof. (Lyon). — Glass Workers' Cataract. (La Cataracte des Verriers).** *Arch. d'Ophtal.*, January, 1929.

(4) This paper is, apparently, an abridged form of a report to "La Commission Internationale des Maladies Professionelles," 1929. As such it deals with the subject under numerous headings, is largely statistical, and includes the statements and opinions of many earlier writers. *Inter alia* it contains a description of the work, and the conditions of work, of those engaged in the glass industry.

In the historical section there are references to Deshais-Gendron in 1770, Demonceaux in 1786, Plenk in 1787, all of whom noted the occurrence of cataract in workmen exposed to intense heat, *e.g.*, blacksmiths and glass workers. Throughout the 19th century the subject received close attention and investigation and statistics relative to the frequency of cataract in glass workers were published by several observers.

Rollet, from his own researches and those of other medical men, concludes that the percentage of cataract in glass workers is about 22.6, compared to a percentage of about 0.78 among the population generally. As to age, while cataract occasionally develops under the age of 30 (Rollet's youngest case was 33 when operated upon), it is most common between 40 and 50.

The pathogenesis of this form of cataract has been much discussed. Recent opinion favours the infra-red rays as the active agent. Rollet asks whether in view of the diversity of opinion on this point, it may not be premature to blame any one category of rays, and suggests that the degeneration of the lens may be ascribed with probability to the combined action of the luminous and calorific radiations from the molten glass.

He ends his instructive article in the following terms:—"We

may state emphatically that improvements in the industry (glass making) is leading to a progressive disappearance of this occupational disease. Man is being replaced by machinery and the glass blower by the mechanic. Glass workers' cataract will become a curiosity in the history of medicine."

J. B. LAWFORD.

(5) **Loddoni, Giovanni.—"Copper Cataract." (La Cataracta de Rame.) An experimental research.** *Ann. di Ottal. e Clin. Ocul.*, p. 28, Anno. LVII, 1928.

(5) Cataracts due to copper splinters in the eye have a characteristic appearance, which has been described as like a sunflower or a ring with spokes radiating out towards the periphery. The ring has usually about the same diameter as the pupil. The colour is greyish-green but varies according to the incidence of the light from yellow to red. The lens change is only visible in reflected light. In ophthalmoscopic examination, the lens looks completely transparent. **Loddoni,** as a result of his experiments and investigations found that fine copper particles were deposited in the anterior and posterior capsules and in the sub-capsular epithelium and the superficial cortex. He considers the variability in the appearance under different incidence of light is due to a fine wrinkling of the anterior capsule.

LESLIE PATON.

(6) **Dascalopoulos (Athens).—The use of adrenaline in operations for traumatic cataract. (L'usage de l'adrénaline dans l'opération de la cataracte traumatique.)** *Ann. d'Ocul.*, p. 251, CLXV, 1928.

(6) **Dascalopoulos** states that on opening the anterior chamber with a keratome in this operation, he always finds the pupil contract as the aqueous humour escapes. This occurs in spite of full dilatation with atropine, owing to the engorgement of the iris vessels. The latter results from the negative pressure produced in the anterior chamber by the escape of the aqueous. The result of this miosis is (1) a diminished area of pupil through which soft lens matter may escape and the retention of an undesirable amount of lens substance behind the iris; and (2) greater irritation of the iris by the curette with consequent liability to posterior synechiae. The method recommended for overcoming this pupil constriction is that of Magitot (*Ann. d'Ocul.*, July, 1927, quoted), namely, subconjunctival injection of 1/1000 adrenaline after the instillation of 1 per cent. atropine drops. A 2 c.c. syringe is used, and filled with 1.5 c.c. of 2 per cent. novocaine solution and 0.5 c.c. of 1/1000 adrenaline. 0.5 c.c. of the mixture is injected subconjunctivally near the cornea in the neighbourhood of the intended site

of the keratotomy. In ten to fifteen minutes the pupil is usually so widely dilated that the iris is hardly visible. The incision through the cornea is made with a keratome 3 mm. anterior to the limbus. The pupil still remains widely dilated, so that a free incision of the lens capsule with a cystitome is possible. Free removal of the swollen lens matter by means of the curette is then easy without any manipulation of the iris.

HUMPHREY NEAME.

(7) **Ellett, E. C. (Memphis).—Loss of vitreous in cataract extraction.** *Jl. Amer. Med. Assoc.*, December, 1928.

(7) **Ellett** gives an analysis of 600 consecutive cataract extractions in which he lost vitreous in 7.6 per cent. of the cases. He quotes Derby who reported a series of operations in which deep orbital and lid injections of novocaine, and corneal sutures were used with 2 per cent. vitreous loss. Some of the precautions to be taken to avoid this complication are given.

A. F. MACCALLAN.

(8) **Knapp, Arnold (New York).—The rôle of the lens capsule in the complications of the cataract operation.** *Jl. Amer. Med. Assoc.*, December, 1928.

(8) **Knapp** reviews 200 successive operations of combined extraction in which the capsule was opened by various recognized means. In this series, 26 cases required the secondary operation of capsulotomy. Some notes are given on the occurrence of glaucoma as a complication after cataract extraction, generally due to adhesion of the lens capsule to the scar of the extraction wound.

A. F. MACCALLAN.

IV.—PATHOLOGY AND HISTOLOGY

(1) **Koby, F. E. (Bâle).—The pathogenesis of fusiform pigmentation of the posterior surface of the cornea.** (*Pathogénie de la pigmentation fusiforme de la face postérieure de la cornée.*) *Rev. gén. d'Ophtal.*, February, 1927.

(1) **Koby** in the first place reviews the literature of " some thirty " recorded cases of " melanosis of the cornea," " Krukenberg's pigmented spindle " or, as he prefers to call it, " fusiform pigmentation of the posterior surface of the cornea." He points out that not only are there very divergent opinions on the pathogenesis, but that the descriptions vary very much both as to the extent, and as to the depth of the pigmentation. Koby then relates

two cases of his own in one of which the spindle was the sequel of iritis, and in the other of which, a case of myopia, its formation was observed to occur in the course of 18 months. If the reviewer understands aright, when first seen the pigmentation was scattered over the back of the cornea, and when seen a year and a half later was in the form of the typical spindle. Koby concludes therefore that the condition may be acquired though he does not seem to deny that it may be congenital. To put his theory quite shortly he supposes that there are two factors in the deposit of the pigment. The first are the natural physiological currents in the aqueous humour due to convection, these currents ascending in front of the iris and descending behind the cornea, the strongest current being vertical and in the middle of the cornea. The second factor, a special one, is pigmentary disintegration most often related to myopia, uveitis or glaucoma. " One knows that often enough in adults one finds a few grains of pigment on the membrane of Descemet. If the movement of pigment is great enough the precipitation on the membrane of Descemet will end by being fusiform. In cases with no inflammation several years would seem to be necessary; a much shorter time if there is inflammation." To explain why women are much more often than men the subjects of this condition Koby makes a remark which seems to show that he is not sure that the condition is always acquired. " This frequency (in women) is perhaps due to their greater proneness to certain forms of chronic uveitis. Or must we admit that the pigmentary disintegration which determines the fusiform deposit may be hereditary and may show a sex-linked dominance." That heredity has also something to do with it is quite well shown by the three double observations of Strebel-Steiger, Vogt, and Seissinger of a spindle in both mother and daughter.

ERNEST THOMSON.

(2) **Weill and Jost.—Concerning a retro-corneal network of trabeculae following interstitial keratitis.** (**Sur un réseau de trabécules rétrocornéens consécutif a une kératite parenchymateuse hérédospécifique.**) *Ann. d'Ocul.*, Vol. CLXIII, p. 100, 1926.

(2) **Weil** and **Jost** describe at length the appearance of a network of delicate threads in the anterior chamber immediately behind the cornea in a case of obsolete congenital syphilitic interstitial keratitis. The threads were noted in an eye that showed signs of having suffered an unusually severe degree of inflammation. Examination with the corneal microscope and slit-lamp showed unmistakably that the threads, having an appearance somewhat similar to that of a spider's web, were in the anterior chamber a very short distance behind the posterior surface of the

cornea, except at their peripheral extremities. The latter were attached to the posterior surface of the cornea and blended with it. These extremities were in many cases bifurcated. Examined under very high magnification individual threads showed an appearance as of being composed of a transparent thin walled tube filled with a homogeneous greyish substance. An exactly similar optical appearance was found to be produced by thin threads of glass or of Canada balsam. The threads were therefore considered to be formed of the same substance as Descemet's membrane. In their origin they were identical with lines observed on the deep surface of the cornea in old cases of interstitial keratitis (Staehli, *Klin. Monatsbl. f. Augenheilk,* Vol. 63, 1919, p. 336). Such lines were due to rucking of the endothelium between the two surfaces of which a deposit of hyaline material or glass membrane took place. In the case recorded, however, it was suggested that these rucks or folds of the endothelium had become detached from the back of the cornea. The detachment of such folds was considered feasible owing to strains produced in the cicatrisation of the severely damaged cornea, and to the fact that the base of the folds consisted merely of two layers of flattened endothelial cells with hyaline material between. The lines produced by folds or rucks of the endothelium should not be confounded with the lines frequently seen in buphthalmos, in keratoconus, and eyes damaged at birth by forceps, although the two types of line showed similarities. The second group was due to actual ruptures of Descemet's membrane.

HUMPHREY NEAME.

(3) **Zeiss, Erich (Halle).—On the origin of the rosettes in glioma. (Zur Entstehung der Gliomrosetten.)** *Arch. f. Ophthal.*, Vol. CXVII, 1926.

(3) The early stages of glioma, as stated in this article by **Zeiss**, are represented by the division of glia cells, mainly only in one direction, to form chains or bands, and where the growth is intensive there is also a division of cells at right angles to the axis of the cell chain. As the proliferation proceeds the cell chains bend and curve in all directions forming eights, and double-eights, bows and the most varied shapes of figures, winding over and under each other into a system of closely intertwining coils. At the points where the plane of the microscopic sections corresponds with that of the axis of one or several loops one sees typical rosettes. The cells entering into the formation of one rosette do not usually belong to the same continuous cell chain, but are derived from two or several different bands. These rosettes, therefore, are not cross sections of formal structures: they represent special shapes of the foldings of glia-cell bands. They have nothing in common with

those seen in microphthalmic eyes which are produced by foldings of the retina.

It is impossible without examining a greater number of cases to draw any inference from the preponderance of the more closed figures (rosettes, spirals, horse shoes) or the more open shapes as to the character or stage of growth of a glioma, although it has been suggested that rapid cell proliferation was unfavourable to the formation of rosettes. The question of the development of rosettes in relation to the intraocular pressure also requires, in the author's view, further investigation.

THOS. SNOWBALL.

(4) **Lundsgaard, K. K. K.—The pneumococcus in connection with ophthalmology.** *Trans. Ophthal. Soc. U.K.*, 1927.

(4) **Lundsgaard** in the Doyne Memorial Lecture gives a survey of the bacteriological characteristics of the pneumococcus, and the peculiarities of the clinical types that are produced by it. He points out that until a few years ago there was no reliable differentiation between the pneumococcus and streptococcus. The bile test now supplies this deficiency, as the true pneumococcus is soluble in bile, while the streptococcus is not.

There are four types of pneumococci, I, II, III, and a miscellaneous group of strains which cannot be classified serologically with any of these three—Group X. It is only from Type I that a therapeutically potent anti-pneumococcus serum can be prepared.

He found that in cultures taken from the conjunctival sacs of people of all ages, pneumococci were present in 6 per cent. of cases. In persons of 65 to 85 years of age, *i.e.*, the cataract age, pneumococci were found in 10 per cent. The majority of pneumococci found on the conjunctiva belong to Type X; those found on the normal conjunctiva are but slightly virulent, while those found in the lacrymal passages, and particularly those derived from cases of ulcus serpens, possess a higher degree of virulence.

The pneumococcal affections of the eye do not present any common characteristic features. The infection, when attacking the conjunctiva, is acute and benign; sometimes it is epidemic, sometimes not. When the lacrymal passages are involved the infection is chronic and fairly benign, whereas it becomes acute and malign when encroaching upon the cornea. In pneumococcal conjunctivitis the organisms are found mainly in the epithelium, while the secretion may be relatively free. The pneumococci keep to the surface for preference, but may invade the deeper layers. They have been demonstrated deep down in the subconjunctival tissue, so that there is in fact nothing to prevent the occurrence of a late infection after an Elliot's operation (in the presence of a pneumococcal conjunctivitis) even though the mucous membrane over the trephine hole is undamaged.

Subconjunctival haemorrhages are of frequent occurrence in pneumococcal conjunctivitis; if these are absent a yellowish streak will frequently be found bordering the vessels; this is a manifestation of a toxic action upon the vessel walls, and is the reaction of the tissues to infection.

Pneumococci are frequently found on scraping the uninjured cornea: this, and the benign form of the keratitis that sometimes occurs in association with a pneumococcal conjunctivitis, tends to indicate that the well vascularised tissues are extremely resistant to the infection, particularly in young individuals. In cases of ulcus serpens, the pneumococcus is generally found in almost pure culture. This affection affords evidence of the great importance of the nutritive condition of the tissues in pneumococcal infections. For, while the typical ulcus serpens is in the centre of the cornea, when it is situated near the periphery, it is not so virulent. Also, on a cornea with pannus, the pneumococcus produces simple infiltration; and, if vascularisation of the cornea occurs simultaneously with an ulcus serpens, a rapid subsidence of the ulcer will be seen.

The typical ulcus serpens arises after a superficial injury. The probable sequence of events is that the epithelium is detached in the form of a flat bulla, which rapidly bursts. The infectious material will accumulate under the epithelial covering of this bulla, and the greyish-yellow superficially infiltrated disc appearing at the initial stage of the affection is constituted by the walls of this bulla after it has burst; this rapidly wears off, leaving an ulcer. The ulcus serpens is thus a subepithelial affection, and as such will have easier play in old people owing to the bad nutritive conditions of their tissues and the partial obliteration of the capillary loops of the limbus.

The seasonal incidence of this type of ulcer is practically the same as that of simple traumatic keratitis, and is not influenced by the organism. The pneumococcus is usually the only causal organism in lacrymal passage affections: the pronounced vascularisation of the mucous membrane in these parts explains the mild type of the infection. As far as wound infections are concerned, the most dangerous infections are due to the pneumococcus.

Lundsgaard does not think that dental affections are of any significance in explaining post-operative infection of the eye; and we do not believe in infection from the air. Thus, provided that the ophthalmic surgeon and his assistants wear masks during the operation, there remain only two possible sources of infection, the lacrymal passages and the conjunctiva.

Serums or vaccines used prophylactically are of little value, as the type of pneumococcus from which a therapeutically active serum can be prepared rarely occurs in ocular disease. He thinks that optochin is not quite harmless to the tissues, also it only takes

effect against the pneumococcus, while mercurochrome is inefficient; and so, for prophylaxis before cataract operation pins his faith to Betti's ointment (almost identical with Pagenstecher's ointment). Great stress is laid on the importance of the care required in the preparation of a suitable ointment of yellow oxide for ocular use. His method is as follows:

"The lacrymal passages are examined by means of fluorescein and irrigation. Cultures are plated on blood-agar. The cilia are cut or epilated. The conjunctival sac is filled with Betti's ointment and a sterile bandage is applied; the inunction is repeated on three successive days at 24 hours' interval. Immediately before operation the conjunctiva is irrigated with sterile saline, and the ciliary margin cleaned with 50-60 per cent. alcohol."

Affections of the tear-sac should of course first be treated. If pneumococci appear in the culture, although there is no lacrymal passage affection, Betti's ointment should be applied and operation deferred until repeated examinations have failed to show pneumococci.

In two years of this routine Lundsgaard has performed 217 cataract extractions, in none of which did any serious infection occur. As regards the treatment of ulcus serpens, extirpation of the tear sac is a most important prophylactic measure. Optochin (2 per cent. solution painted on three times a day) may be profitably employed in a quite superficial case of ulcus serpens; in more deep-seated cases an attempt at vascularisation by means of a conjunctival flap should be made.

G. G. PENMAN.

(5) **Jaensch, P. A. (Breslau).—Fatty degeneration in the eye. (Die degenerative Verfettung am Auge).** *Arch. f. Ophthal.*, Vol. CXIX, Pt. 1, 1927.

(5) **Jaensch** discusses in this, his first article on the subject, the deposition of fat in diseases of the cornea with special reference to the conditions found in keratomalacia.

He examined microscopically four eyes obtained from children affected with this disease, all showing necrosis of the epithelium and superficial layers of the cornea with massive cell-infiltration, all the signs of severe ulceration, and a deposition of fat which he inferred was of a degenerative character and not an infiltration. He regards the cell infiltration before the necrosis of the epithelium and the formation of an ulcer as the primary stage of this fatty decomposition, the cells breaking down with liberation of fatty particles which are taken up by other cells (histiocytes, polymorphs and lymphocytes).

The examination of the eyes of a series of rats fed on a vitamine-free diet confirmed his views of the degenerative origin of the fat.

He concludes that keratomalacia is a primary affection due to a toxic disturbance in the cornea, leading to bacterial infection, in an organism whose resistance is diminished through vitamine deficiency : the bacterial infection, while of secondary importance, has a great influence on the course of the disease, which is most serious when streptococci and pneumococci are present. In other diseases, such as neuroparalytic keratitis and herpes corneae, with trophic disturbance, the process follows the same sequence as in keratomalacia, the deposition of fat being always found at the site of the greatest cell infiltration.

THOS. SNOWBALL.

(6) **Velhagen, jr. Karl (Freiburg i. Brg.).—Experimental researches on papillitis in purulent inflammations of the anterior portion of the eye. (Experimentelle Untersuchung ueber Papillitis bei eitrigen Entzündungen des vorderen Bulbusabschnittes.)** *Arch. f. Ophthal.*, Vol. CXIX, Dec., 1927.

(6) **Velhagen** set up a mild infection in the anterior portion of the vitreous and the ciliary body in rabbits with the staphylococcus pyogenes aureus, and succeeded with the greatest regularity in producing a papillitis which could be observed with the ophthalmoscope.

The papillitis appears two days after the inoculation, reaches its climax in seven days, and in the third week subsides, and leads to post-neuritic atrophy. This inflammation is of toxic origin, and is therefore fundamentally different from the neuritis produced by the herpes virus (employed by v. Szily in his researches on sympathetic ophthalmitis), differing from it also by the fact that, apart from the absence of choroiditis, this inflammation advances only a very short distance along the optic nerve and has no power to spread to the brain or the other eye, unless it penetrates the coats of the inoculated eye and purulent meningitis ensues. Such a contingency rarely arises because death supervenes, but it is at least conceivable.

His experiments furnish fresh evidence against the view that staphylococci have to be taken into account in the study of sympathetic ophthalmitis.

THOS. SNOWBALL.

(7) **Velhagen, jr. Karl (Freiburg i Brg.).—Experiments with herpes virus on the problem of the transmission of infection from eye to eye. (Experimente mit Herpesvirus Zur Frage der Infektionsübertragung von Bulbus zu Bulbus.** *Arch. f. Ophthal.*, Vol. CXIX, December, 1927.

(7) The main points of this research of **Velhagen** on the transmissibility of infection from one eye to the other are as follows :—

v. Szily's experiments, in which he produced an inflammation

in the second eye by the intraocular inoculation of herpes material, were successfully repeated by the author in 20 per cent. of his cases.

By a modification of the technique he was able with the ophthalmoscope to observe in the inoculated eye that papillitis frequently occurred a few days after the onset of the preliminary iridocyclitis.

This papillitis in the inoculated eye was never absent in any of the cases in which the second eye became affected; it preceded the disease in the latter by at least four days.

In the affection of the second eye three types of inflammation can be distinguished:—(*a*) primary papillitis (possibly in association with iridocyclitis); (*b*) primary (plastic) iridocyclitis; (*c*) herpes corneae. It is probable that these different types of inflammation arise by different paths of transmission: the optic nerves and sheaths together with all other ocular nerves with their sheaths as the " migratory " path, and the circulation by metastasis.

The herpetic intraocular inflammation is very prone to attack the uvea, more particularly the iris and ciliary body, and to a less degree the choroid.

In no case where the second eye was affected was intensive encephalo-meningitis absent. v. Szily's method of effecting the endogenous transmission of infection from one eye to the other is a model form of experiment for the study of true sympathetic ophthalmitis; but the essential point in the production of inflammation in the second eye lies not so much in the technique of introducing the infection into a pocket as in the employment of the ultra-micro-

of post-herpetic vitiligo and haemorrhagic herpetic iritis.

The intraocular herpetic inflammation leads to conditions that are very similar to those found in man: examples of these are cases of post-herpetic vitiligo and haemorrhagic herpetic iritis.

THOS. SNOWBALL.

(8) **Horniker, E. (Trieste).—A new point of view in the pathogenesis of certain degenerative changes in the eye. (Ein neuer Gesichtspunkt in der Pathogenese einiger degenerativer Veränderungen des Auges.)** *Arch. f. Ophthal.*, Vol. CXIX, 1928.

(8) **Horniker** was struck, on examination with the slit-lamp and loupe, by the frequency with which he observed punctate opacities of the lens (with cataracta coerulea) and, to a less degree, degenerative changes in the cornea, and in seeking for an explanation of their occurrence found over a large number of cases, here analysed in detail, that they were associated with more or less marked inherited constitutional anomalies of the vegetative nervous system (*e.g.*, migraine, acroparaesthesia, etc.): these changes in the lens and cornea, indeed, were the sign of a vaso-neurotic diathesis. In cases with such a diathesis some of the symptoms

are due to disturbances in the capillaries, and in seeking a parallel condition in the eye he points out the various independent rings of terminal capillaries that surround, and supply nutrition to, the avascular dioptric system of the eye, and he suggests that the capillaries in the various terminal zones of the eye are subject to the same intermittent spastic disturbances as occur in other parts of the body, and these disturbances by producing a temporary ischaemia may bring about degenerative changes in the tissues supplied by them, the degenerative phenomena depending on the intensity and duration of this ischaemia, and in the case of the lens being observable clinically as opaque dots mostly permanent in character.

Confirmation of his contention that the disturbances assumed for these lens changes are possible and do occur in the capillaries of the eye is found in the degenerative changes at the macula as the result of capillaro-spastic conditions (that have been described by other writers), and in the positive vascular signs, seen in vaso-neurotic persons, that are due to the increased tone of the capillaries and arterioles surrounding the macula.

THOS. SNOWBALL.

(9) **Callender, George R., and Campbell, Helenor (Washington, D.C.)—Report of the Section on Ophthalmic Pathology of the Army Medical Museum.** *Amer. Jl. of Ophthal.*, June, 1928.

(9) Callender and Campbell's article gives details of the various procedures carried out in the preparation of pathological specimens and gives the following particulars of a method for procuring post-mortem specimens. As soon after death as possible 0.25 c.c. of full strength formalin should be injected into the vitreous through a fine needle passing through the equator of the eye-ball on the temporal side. The posterior segment of the eye-ball can then be removed after breaking through the roof of the orbit without disfiguring the body and without detaching the retina. Bouin's fluid is the best fixative to use in these cases.

F. A. WILLIAMSON-NOBLE.

BOOK NOTICES

Physiologische Optik. By Dr. A. KÖNIG, Jena. With 70 figures. (Being Vol. XX, Part I, of Wien and Harms' Handbuch der Experimentalphysik). Pp. 240. Leipzig: Akademische Verlagsgesellschaft M.B.H. 1929. Price 22 Reich Marks.

We have recently reviewed a book on physiological optics by Hillebrand (*Brit. Jl. of Ophthal.*, Vol XIII, p. 215), drawing attention to the fact that the subject was considered specially from

the physiological and psychological point of view and incorporated the opinions of Hering and his school. The present work is written by a physicist and the subject is treated from the starting point of the stimulus rather than that of the response. The two books are therefore complementary and neither should be neglected by students of physiological optics. It was intended that this volume should have been written by Prof. Pulfrich, but only the introduction and small sections on the field of vision, eye movements, and the Fechner law were completed at the time of his death. It has fallen to Dr. A. König, an optician, to carry out the major part of the work. His is a name honoured in the history of physiological optics, for the work of A. König, who was Helmholtz's assistant, on the effects of illumination on visual acuity and on colour vision has rightly attained the dignity of becoming classical. We understand that the present author is no relation of the earlier König.

The book is an admirable description of up-to-date knowledge of Physiological Optics, with full bibliographical references. Since it covers the whole range of the subject in little more than 200 pages it cannot be regarded as exhaustive. Indeed there are places where the compression is so great that there is some lack of lucidity, and some of the figures would be more intelligible with further explanation. The classical work of Helmholtz and others is therefore by no means superseded by the present work, but taken in conjunction with that masterpiece and with Hofmann's " Die Lehre vom Raumsinn des Auges " it will prove an invaluable addendum. It is beautifully printed, and the price is more reasonable than is now customary for German scientific books.

Functionelle Veränderungen am Gefässystem der Netzhaut. By K. MYLIUS. Pp. 82 + 16 plates containing 35 photographs of the fundus oculi. Berlin : S. Karger. 1928. Price M.8.00.

Functional changes in the retinal vessels have as yet received but little attention, though their existence is well known ; the monograph under review represents Mylius's personal contributions, the greater part of which is devoted to the changes observed in eclampsia and pre-eclampsia. By functional changes the author understands in the main two conditions, one—the more important —being spasm, and the other hypertonicity of the vessel wall. Spasm may be not only of the most transient nature, but also localised to a small segment of a vessel, and is hence often missed; it may be more extensive, when spasmodic contractions can be seen to travel along greater extents of the vascular tree; and in the severest cases it may pass into a state of tetanic contraction, giving rise to very constricted vessels which are then maintained in this condition for a variable period (lasting sometimes even for weeks).

By hypertonus the author understands an increase in the normal tone of the vessel wall, which in contrast to spasm and tetanic contraction does not imply an expenditure of energy to maintain the vessel in its new state. All these conditions are functional in the sense that in themselves they allow a return to the normal; secondary changes, such as exudates, may indeed occur, but they are the results of the impeded circulation—consequences rather than the concomitants of the functional changes. These functional changes are by no means isolated phenomena: they may be both superadded to organic lesions and be the precursors of such lesions.

The endless vagaries and combinations that the ophthalmoscopic appearances can show, are well illustrated by careful and lucid descriptions. The visual disturbances associated with these changes are just as varied: they may be absent altogether, or give rise to flashes of light, transient momentary blindness, or even loss of vision lasting for days, with either complete or incomplete restoration, depending upon the secondary changes that may have supervened.

Apart from the intrinsic interest in the conditions described by Mylius, the monograph is of importance in bringing forward evidence to show that functional changes can pass imperceptibly into organic lesions. This is closely bound up with the question of the relationship of retinal changes to the anatomical changes in the vessel wall in various retinal lesions, such as retinitis of pregnancy, and albuminuric retinitis, to mention only two. In the case of albuminuric retinitis it is well known that the retinal changes bear no direct relationship to the anatomical changes in the arterial wall; indeed the vessel wall is sometimes quite unaffected in the severest cases of renal retinitis. Whether spasm plays any part in devitalising the retinal tissue in such and in other cases is a problem that will have to be considered. And this is but one only of the many problems that this monograph raises.

The Study of Intracranial Surgery. By HUGH CAIRNS. Pp. 82, illustrations 36. London: His Majesty's Stationery Office. 1929. Price, 3/-.

This report is a survey of the methods of diagnosis and treatment employed in Dr. Harvey Cushing's Clinic at the Peter Bent Brigham Hospital, Boston. It has particular interest because it is written by an independent English observer who acted for a year as Assistant Resident Surgeon. He has tried as far as possible to " let the cases tell their own story " and there are detailed reports of 32 cases in the text, each of which serves to emphasise some important point. Ophthalmology naturally plays a large part in diagnosis since this often depends on the presence of changes in

the disc and fields. For example, a case is quoted of cranio-pharyngeal pouch cyst, in which the sole symptoms complained of were mental deterioration and drowsiness. The discovery of early papilloedema led to X-ray examination which disclosed signs of calcified cyst. Operation followed and the boy completely recovered. The author remarks that had it not been for an ophthalmoscopic examination, it is highly probable that the boy would have passed eventually into an asylum, blind and mentally deranged.

Mention is also made of Walker's method of field examination, on a screen at two metres distance with test objects varying from 40 to 1 mm. in diameter. It is noteworthy that the workers at the Clinic depend almost entirely on perimetry to distinguish between cerebellar tumours and those not infrequent temporal and occipital tumours which give cerebellar signs.

The method of quantitative perimetry is regarded by many as being a modern development of the old procedure, but it was actually described as long ago as 1896 by Simon, who, using a range of objects from 1.5 mm. to 10 mm. wrote " one must work out the size in each case."

Other methods of diagnosis which received consideration are, clinical investigation, X-ray examination, ventriculography and exploratory craniotomy.

The description of these is followed by a section on treatment and the report closes with an instructive analysis of the fatal cases occurring during the year. The whole paper is excellently written and cannot fail to interest ophthalmologists, particularly those who are not satisfied merely with the diagnosis of optic atrophy but like to go further and find its cause.

OBITUARY

Professor H. TRUC, of Montpellier

THE recent death of Professor TRUC at the age of 72 has removed a well-known figure from the ranks of ophthalmology in France. Struggling successfully against unusual difficulties in early life Truc became a student of Medicine at Lyons, and obtained his doctorate in 1885. He practised first as a general surgeon but two years later began to devote himself to ophthalmology. In 1891 he was appointed to the Chair of Ophthalmology at Montpellier University and held this post until he reached the age limit. Last year a commemorative medal was presented to him by his former pupils and colleagues.

Truc's contributions to ophthalmic literature were numerous

and manysided. Among his important papers were those on Ocular Hygiene in relation to schools and workshops; he was also the author of a valuable and well-known book "Nouveaux Eléments d'Ophtalmologie." He was interested in the subject of heredity in disease of the eye and devoted much time and care to the investigation of congenital stationary night-blindness of which the remarkable Nougarien group occurred in his neighbourhood. He also showed much practical interest in the welfare of the blind.

NOTES

Middlemore Prize

THE Middlemore Prize of the British Medical Association (1928) has been awarded to Mr. W. S. Duke-Elder for an essay on "The Clinical Study of the Vitreous Body, its Swellings, Contractions, Opacities, and Reactions to Toxic Invasions: with special reference to Glaucoma and Detached Retina."

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North of England Ophthalmological Society

THE officers of the North of England Ophthalmological Society for the Session 1929-1930 are as follows:—President, Thomas Snowball, Burnley; Vice-President, H. Cecil Snell, Sheffield; Members of Council, J. D. McCulloch, Bradford, and W. M. Muirhead, Sheffield; Treasurer, W. H. Kiep, Bradford; Secretary, Percival J. Hay, Sheffield.

FUTURE ARRANGEMENTS

1929

June 14.—Section of Ophthalmology, Royal Society of Medicine. (Annual Meeting).

July 4-5.—Oxford Ophthalmological Congress, at Oxford.

September 5-13.—**International Congress of Ophthalmology at Amsterdam.**

CONTEMPORARY OPHTHALMIC LITERATURE

American Journal of Ophthalmology. *March.*

HOLBROOK LOWELL. Measured correction of squint by combined technique.
KEY. A case of trichinosis with exophthalmos.
O'ROURKE. The optical correction of conical cornea with the contact glass.
KNIGHTON. Hyperopic undercorrection due to retinoscopy.
EVANS. A scotoma associated with strabismus.

April.

CALHOUN. The vascular state and glaucoma
FERREE, RAND, and MONROE. Studies in perimetry: 2, preliminary work on a diagnostic scale for the colour fields.
REDWAY. Photomicrography of the living eye: 5, the physics of certain types of corneal opacity.
MAYER. Rhabdomyoma of the eyelid.
LOEB and MEYER. Retinal haemorrhage as an expression of vicarious menstruation.
CRISP. The value of the postcycloplegic test.

Archives of Ophthalmology. *March.*

WEILL. The relationship between inflammation of the posterior sinuses and disease of the nervus opticus.
KNAPP. Retinal degeneration in macular region without cerebral symptoms.
PILLAT. Marked epiblepharon with retroflection of the eyelashes of both lower lids in an adult Mongolian.
GOLDSTEIN and WEXLER. The preretinal artery: an anatomic study.
GIFFORD, BENNETT, and FAIRCHILD. Cataract in myotonic dystrophy.
KENNEDY. Ocular disturbances in epidemic encephalitis.
DENIG. Circumcorneal transplantation of buccal mucous membrane as a curative measure in diseases of the eye.
KIRBY, ESTEY, and TABOR. Cultivation of lens epithelium in vitro.

The Journal of Ophthalmology, Otology, and Laryngology.

February.

SACKIN. Osteoma of nasal accessory sinuses.
TURTZ. Use of potassium iodide in ophthalmology.

Annales d'Oculistique. *March.*

GAUDISSART. Quantitative perimetry: 2, perimetry with coloured test objects.
GABRIÉLIDÈS. Dengue fever and its ocular complications.
KOBY. Hydrophthalmos in a pig together with microphthalmos of the opposite side.
KOLIOPOULOS. Anatomical researches into the causes of ocular hypertension in choroidal tumours.

Archives d'Ophtalmologie. *February.*

TERRIEN. Remarks on tumours of the iris.
GABRIÉLIDÈS. Galien's optotype.
PARLANGE. Ocular sequelae of poison gas injuries.

March.

VELTER. Introduction to study of ocular neurology.
SHOJI. A case of primary epithelioma of a Meibomian gland invading the orbital cavity with atrophy of the globe.
ALEXIADÈS. A case of pronounced bilateral external and symmetrical corectopia.
VILLORIA. Carotico-cavernous aneurysm without pulsating exophthalmos.
TEULIÈRES and PARLANGE. Contribution to the radiological study of the lacrimal passages (normal and pathological).

Archiv für Augenheilkunde.

POLEFF. The formation of antibodies in corneal explants.
WINKLER-PRINS. Experimental tuberculosis of the eye and its treatment with sanocrysin.
LEVINSOHN. New methods of combating short sight.
TAGAWA. On the dispersion of the refracting media of the eye.
ACHERMANN. On the action of theophyllin on the permeability of the blood-aqueous boundary in the human eye.
OHM. Oblique squint.

KAUFMANN. Optochin-iontophoresis.
BRAUN. Binocular vision after plastic operation on the cornea and operation for squint.
MEUMANN. On the non-congenital form of hereditary ptosis.
INCZE. On the correct determination of the blind spot.
DIETER. On the measurement of the intraocular blood pressure and its meaning in the investigation of the problem of glaucoma.

Archiv für Ophthalmologie. *March.*

SUNDQVIST. On the theory of spectacles and magnifying glasses.
BIELSCHOWSKY. On oculo-motor paralysis with cyclical changes of cramp and relaxation in the injured eye.
ZINSSER. Contribution to the knowledge of exudative retinal diseases.
BÖHLER. A right sided microphthalmos and congenital cryptophthalmos in a dog.
LÖWENSTEIN. On the aetiology of keratoconus.
CAVKA and PRICA. On the action of lysozyme in normal and pathological secretions.
HERZAU. On the horopter in oblique position of the eyes.
SERR. Criticism and experiments on the theory of ocular tension and its connection with intraocular blood pressure.

Archivio di Ottalmologia. *February.*

NICOLATO. Alterations of the fundus oculi in disseminated sclerosis.
ROSSI. Considerations on the pathological anatomy of trachoma.

March.

BARRIÈRE-MALET. Lymphosarcoma of the conjunctiva.
MARIOTTI. Ocular lesions of pregnancy.
CAOCCI. An unusual observation of periodic paralysis of the oculo-motor nerve. (Ophthalmoplegic migraine of Charcot).
LATTERI. Contribution to the study of orbital enchondromata.
LAMPIS. The syndrome of Claude Bernard-Horner.
MEZZATESTA. Acute traumatic glaucoma.
PADOVANI. Traumatic ocular hypertension of delayed onset.

Anales de la Sociedad Mexicana de Oftalmologia y Oto-Rino-Laringologia.

TORRES ESTRADA. Conditions which should be fulfilled by the suture in the operation of advancement.

Archivos de Oftalmologia Hispano-Americanos. *April.*

ANSIAN. Can the oblique muscles be adductors?
ORTIN. Vascular theory of the genesis of myopia.
NICOLICH. Fight against trachoma or fight against the causes of blindness?
MORATAL. Elliot's trephine operation in chronic glaucoma.

Revista Oto-Neuro-Oftalmologica y Cirurgia Neurologica.

March.

WINTHER. Affections of the optic nerve in epidemic encephalitis.
FERRAZ, ALVIM. Ocular signs in Bayle's disease.
VAMPRÉ. Paralysis of upward movement.
ALBERNAZ. Gradenigo's syndrome from an injury to the ear.

April.

ESCAT and FRENKEL. Optic neuritis and sphenoidal sinusitis.
DE FINE LICHT. Radiological examination of tumours in the region of the hypophysis.
TRAPOTE. Inflammatory pseudo-tumours of the orbit.
ERRECART. Inaugural conference of the official course of oto-rhino-laryngology.